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Estimating Water Treatment Costs Volume 3. Cost Curves Applicable to 2,500 gpd to 1 mgd Treatment Plants

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16. ABSTRACT

This report discusses unit processes and combinations of unit processes that are capable of removing contaminants included in the National Interim Primary Drinking Water Regulations. Construction and operation and maintenance cost curves are presented for 99 unit processes that are considered to be especially applicable to contaminant removal. The report is divided into four volumes. Volume 1 is a summary volume. Volume 2 presents cost curves applicable to large water supply systems with treatment capacities between 1 and 200 mgd, as well as information on virus and asbestos removal. Volume 3 includes cost curves applicable to flows of 2,500 gpd to 1 mgd. And Volume 4 is a computer program user's manual for the curves included in the report. For each unit process included in this report, conceptual designs were formulated, and construction costs were then developed using the conceptual designs. The construction cost curves were checked for accuracy by a second consulting engineering firm, Zurheide-Herrmann, Inc., using cost-estimating techniques similar to those used by general contractors in preparing their bids. Operation and maintenance requirements were determined individually for three categories: Energy, maintenance material, and labor. Energy requirements for the building and the process are presented separately. Costs are in October 1978 dollars.

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PLUME RISE STUDY AT SHAWNEE STEAM PLANT — DATA PRESENTATION

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ABSTRACT

This report makes detailed data on plume rise available for independent analysis by other specialists studying atmospheric dispersion. Techniques of data collection and methods of data reduction are detailed. Data from 62 time-averaged observations of the plume at Shawnee Steam Plant, its source, and the meteorological conditions are reported. Most of the data were collected during early to midmorning and are therefore characterized by stable atmospheric conditions. The data are presented in both a summary and a detailed format.

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PLUME RISE STUDY AT SHAWNEE STEAM PLANT--DATA PRESENTATION

1. INTRODUCTION

The Tennessee Valley Authority (TVA) has studied and documented the plume rise and diffusion of the atmospheric effluent from its coal-fired steam plants since the early 1950's.[1-10] Because of the increasing importance of impact assessment, engineering evaluations, air quality control, and air quality compliance, TVA recently conducted additional field studies, more comprehensive in scope and more accurate in technique. These studies were designed to collect data for use in developing and validating diffusion models used by TVA. Because plume rise is perhaps the most important parameter in many diffusion calculations, particular emphasis was placed on its accurate measurement. Because of the importance of plume rise and the belief that other students of atmospheric phenomena may benefit from this information, TVA is presenting these plume rise data to the public. This data presentation is the first step in the analysis of these plume rise data.

The data obtained from 62 time-averaged observations of the plume from Shawnee Steam Plant, conditions of the plume source, and the meteorological conditions were collected during July and August 1973 and from October to December 1974. The plume data were collected photographically. Most of the data were collected during early to midmorning and are therefore characterized by stable atmospheric conditions. Only 12 of the plume observations were made when the average potential temperature gradient in the plume environment (stack top to plume top) was less than 0.10°C per 100 m. The maximum temperature gradient observed was 3.64°C per 100 m. The wind speed in the plume environment averaged 6.4 m/s and ranged between 2.8 and 19.2 m/s.

2. EQUIPMENT DESCRIPTION AND EXPERIMENTAL TECHNIQUE

The plume-rise study had several objectives:

1. To obtain sufficient information on plant operating conditions to allow reasonable estimation of the fluxes of heat and mass emissions from each stack.

2. To document plume behavior photographically to as great a distance as possible.

3. To document the meteorological variables of temperature, wind speed, wind direction, and rate of turbulent energy dissipation (ε).

Shawnee Steam Plant, its surrounding area, and the field study equipment and experimental technique used to document these data are described.

Plant and Site Description

Shawnee Steam Plant, located about 16 km west of Paducah, Kentucky, is on the south bank of the Ohio River. The terrain around the plant consists of flat and gently rolling cultivated land, gradually sloping toward the river on both sides of the reservoir (Figure 1).

The plant consists of ten units and ten stacks. All units have a normal full load of about 175 MW each, and each unit has a 76-m stack. Each stack has an exit diameter of 4.3 m and a nominal exit velocity of about 15 m/s. The azimuth of the line of stacks is 118°, and unit 1 is in the most westerly location. The stacks are spaced 25.2 m center to center. Figure 2 is a photograph of Shawnee Steam Plant.

The units are equipped with mechanical collectors and electrostatic precipitators, which have a combined collection efficiency of 85 to 90 percent. The ratio of physical stack height to building height is 2.5, which equals the 2.5 rule for downwash prevention. Thus, downwash should not be a problem at the Shawnee Steam Plant; no significant downwash was observed during this plume photographic study.

Plant Operational Data

Plant personnel collected plant operational data daily. Data on generation level, coal consumption, and gas temperature at the exit of the gas preheater were collected hourly for each generating unit during the daily periods of study. Also, samples of coal were collected hourly from each weighing scale of each generating unit. Daily composite samples, made by blending all coal samples collected during each day, were averages for the entire plant during the period of plume photography. The samples were analyzed daily by plant personnel for content of moisture, volatile matter, ash, sulfur, and energy.

Plume Observation

Plume geometry was measured by means of a photographic technique developed by Halitsky[11] and used by Slawson[12] and Slawson et al.[4,5] A single-lens-reflex, 35-mm, Honeywell-Pentax camera with lenses of various focal lengths and color slide film (Kodachrome ASA-64) was used to photograph the plumes. The camera was mounted on a special leveling base made from a modified surveyor's transit. With the use of the leveling base, the axis of the camera lens and the film bottom were both set horizontally by adjusting the transit leveling screws. Several potential locations for the camera station were selected before the start of the study, and the azimuth and distance from the plant were measured from a topographic map for each camera station. Because of trees obstructing a view of the stacks and plume, an insufficient set of

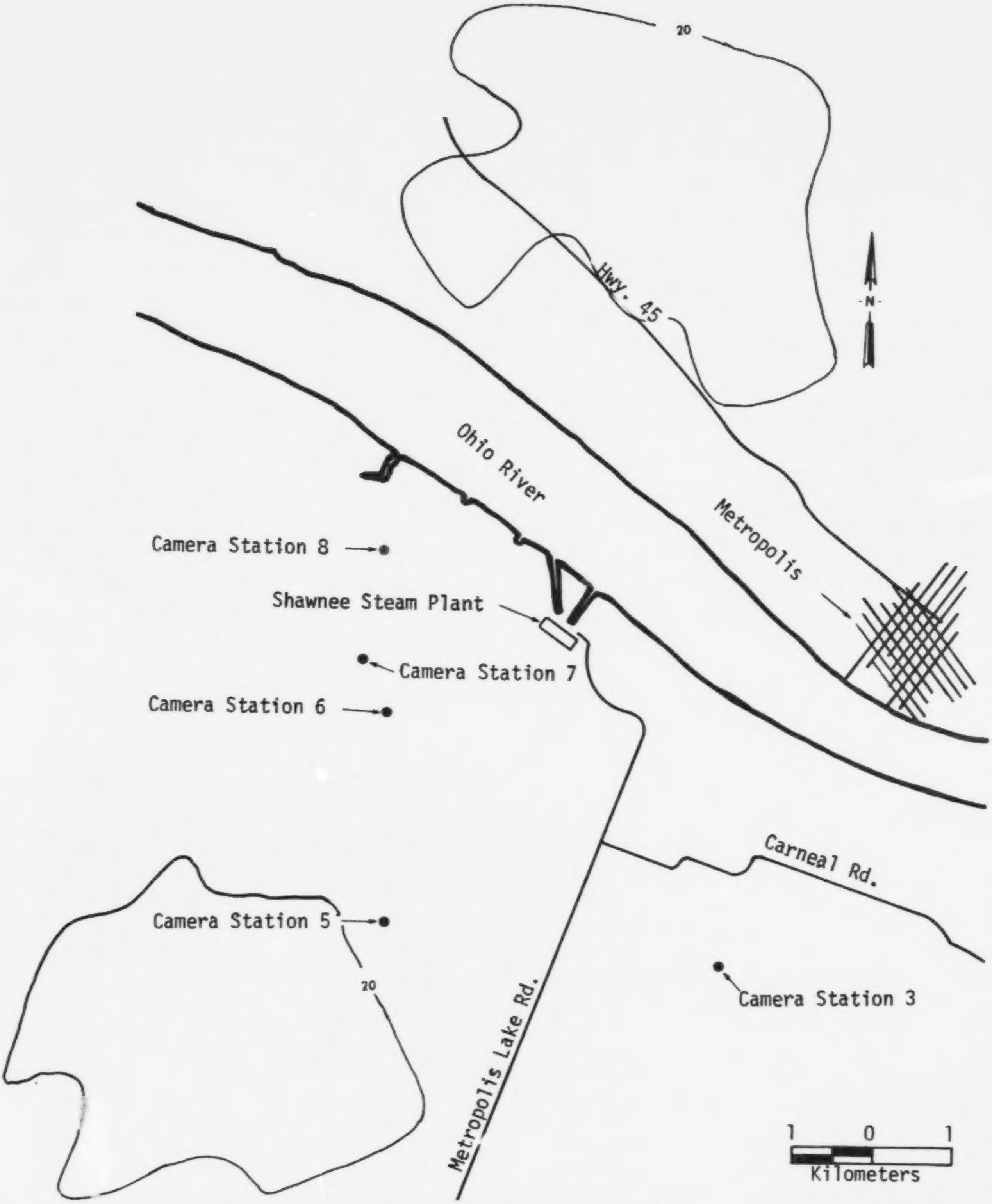

Figure 1. Region around Shawnee Steam Plant including camera station locations.

Contours are meters above plant grade

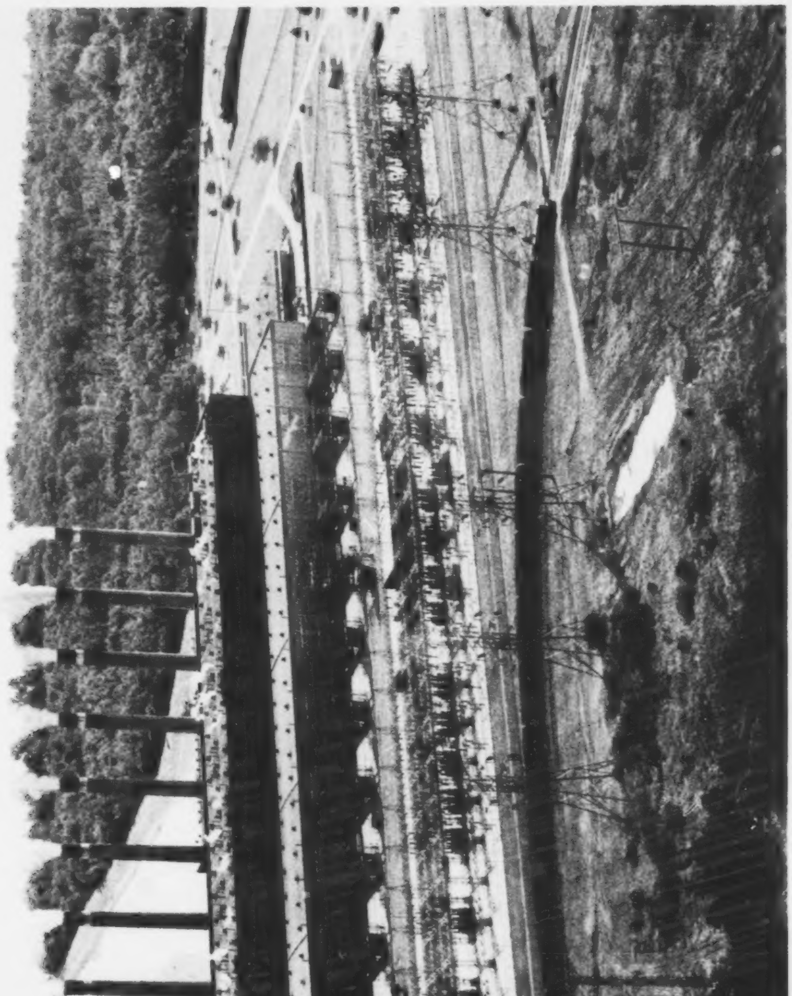

Figure 2. Shawnee Steam Plant.

camera station locations was available for favorable photography for some plume directions. Locations of the camera stations used in this study are also illustrated in Figure 1. Figure 3 shows a typical setup of a camera station.

A camera station was selected each day on the basis of plume direction, as determined from helicopter observations. The camera station was relocated if a substantial shift in plume direction made a different location more favorable. When the operator arrived at a selected camera station, he carefully leveled the camera and aimed it at the center of the plant. Looking through the camera, the operator rotated it horizontally to increase the view of the plume; the angle and direction of rotation were recorded. A lens was selected to achieve as long a view of the plume as possible, and its focal length was recorded. The plume was photographed every 2 min for a period of about 30 min during each hour of the daily study period when conditions were favorable. To ensure identification of each slide, a large clock and a sign with plant name, date, and camera station number were located in the photographic field of view.

Ambient Air Data

Atmospheric conditions were monitored by helium-filled pilot balloons, airborne instruments, and instruments on a meteorological tower. Atmospheric profiles of dry-bulb temperature and the dissipation rate of turbulence were measured twice each hour with airborne instruments. Pilot balloons were released twice each hour in succession and were timed to coincide with the aircraft profiles and sequences of photographing the plume.

Wind Measurements

Wind profiles were obtained by observing a 10-g pilot balloon every 30 s as it ascended for a 10-min period. The pilot balloons were inflated to obtain an ascension rate of 152 m/min and were tracked by means of a single theodolite (Warren Knight model 85). To reduce error, each balloon was inflated in an enclosed van and was tracked by an experienced operator. Figure 4 shows a typical pilot balloon (pibal) station. Both dual- and single-theodolite pibal techniques were used, depending on the availability of trained personnel. Whenever possible, the dual-theodolite pibal technique was used. During each hour of the experiment, two pibals were released sequentially. The wind profiles computed from these pibals were averaged to reduce random errors and to suppress the effects of random fluctuations in the wind field on the calculation of the mean wind. Sufficient personnel was not available to allow use of the dual-theodolite pibal technique during all experiments. It was believed that averaging two sequential, single-theodolite pibals was an effective technique to produce accurate estimates of mean wind speed in the flat region around Shawnee Steam Plant.

Figure 3. Typical setup at camera station.

Figure 4. Typical setup at pilot balloon station.

Temperature and Turbulence Measurements

Temperature profiles were obtained with fast-response temperature sensors, constructed by TVA personnel and installed in a helicopter (Bell model 47G4A) and a fixed-wing aircraft. This temperature system uses a fast-response, Yellow Springs thermistor that is electronically compensated to have an effective linear range of -25 to 48°C in eight spans of 10°C each. The system, which has a linearity of ±0.15°C, is described by Schorn and Brackeen.[13] The rate of dissipation of turbulent kinetic energy ($\varepsilon^{1/3}$) was measured with a universal indicated turbulence system (Meteorology Research, Inc., model 1120) installed in the fixed-wing aircraft. The sensors were located on the right wing-strut in the region of undisturbed airflow. Temperature and dissipation of turbulent energy were recorded with dual-channel, electric-writing, strip-chart recorders (Hewlett-Packard model 7100B), equipped with event markers on the right and left sides. One event marker automatically provided a 1-min signal, and the other, controlled by the operator, was used to record altitude intervals.

For general information, the field engineer in the helicopter measured temperature profiles at irregular intervals. Two profiles of temperature and dissipation of turbulent energy were measured hourly from 33 to 1500 m (100 to 5000 ft) by personnel in the fixed-wing aircraft in both ascending and descending flights. These two profiles were averaged to reduce errors and suppress the effects of random fluctuations. Helicopter and aircraft altimeters were zeroed to plant elevation daily. Agreement between temperatures measured from the aircraft and those measured from the helicopter was generally excellent. Aircraft temperature records are reported here, except for a few cases in which helicopter data are used in place of missing aircraft data. Temperature instruments were calibrated by TVA instrument specialists before and after the field study. Internal electronic calibration of the turbulence monitor was checked hourly; however, no absolute or primary calibration was available for this instrument.

Meteorological data were also measured at ground level. Before each pibal release, dry- and wet-bulb temperatures were measured with a Bendix Psychron (model 566-2), and speed and direction of the wind were measured at ground level with a Belfort, handheld, wind-measuring set. When this study was conducted, a water tower located at a distance of 0.5 km on an azimuth of 167° was used as the meteorological tower. The tower was 162.5 m above mean sea level, and the sensors were located at 1.4 m and 53.2 m, with wind speed and direction measured only at the 53.2-m level.

Daily Experimental Procedure

A typical day of experiments began when the field crew arrived at the plant before dawn and the aircraft took off. Atmospheric profiling equipment in the fixed-wing aircraft was operated by contract personnel; all other measurements were made by experienced TVA personnel. As soon as the plume direction was determined by helicopter observations, the field engineer directed the camera station operator to proceed to the most favorable site for photographing the plume. The sequence of wind measurements by pibals was conducted during all photographic sequences. Plant personnel was notified daily when to begin data collection and temporary reduction of precipitator performance. Precipitator collection efficiency was reduced only to that degree necessary to darken the plume sufficiently for plume photography and visual tracking.

3. DATA PROCESSING AND TABULATION

Data from the plant, photographic reduction, and ambient soundings were coded for computer processing, display, and analysis. This section describes the reduction techniques used to obtain the data summarized in Section 4 and detailed in Appendix A.

Exit Temperature and Velocity

Stack exit temperature was estimated from hourly measurements of the temperature of the flue gas as it left the air preheater. After leaving the preheater, the gas was further cooled through heat losses through the particulate collection equipment and to the stack. Previous TVA experience has shown these heat losses to be about 3°C through the collectors and 3°C per 100 m of stack. These factors were applied to estimate temperatures at stack exits. Significant variation is possible among units, but generally, exit temperatures were found to be positively correlated with generation level and ambient temperature. The observed generation each hour and the temperature of air leaving the preheater are tabulated in Appendix A.

No direct measurement of the flow rate or exit velocity of flue gas was made during this study. Exit velocity (V_o) from the stack was estimated from empirical equations obtained from boiler tests previously conducted by plant personnel.

$$V_{oi} = (0.0655G_i + 0.529)(T_{oi}/273), \quad (1)$$

where

i = arbitrary generating unit, numbers 1 to 10,

G = unit generation level, MW,

T_o = stack exit temperature, K.

To check the exit velocity predicted by Equation (1), an independent analysis based on the theoretical products of combustion was performed. Table 1 presents the stoichiometric combustion analysis based on average proximate coal analysis during the study period. This table gives useful estimates of gas density and constituents. The gross efficiency of Shawnee Steam Plant, calculated from the data sets collected each hour during the study, was found to average about 33.8 percent with a standard deviation of 5.2 percent. Estimates of exit velocity based on the combustion analysis and plant efficiency agree with values predicted by Equation (1).

The air preheater exit temperatures and estimated exit velocities were used to calculate generation-weighted, average stack exit conditions of temperature and velocity. The fluxes and length scales of momentum and buoyancy for the plant (stacks 1 through 10) were also calculated from these data. The average fluxes and length scales are based on the relationships,

$$F_m = R_o^2 V_o^2 T_a / T_o; \quad (2)$$

$$F_b = g R_o^2 V_o (T_o - T_a) T_o; \quad (3)$$

$$L_m = \sqrt{F_m} / \bar{U}; \quad (4)$$

$$L_b = F_b / \bar{U}^3; \quad (5)$$

where

F_m = flux of momentum, m^4/s^2,

F_b = flux of buoyancy, m^4/s^3,

L_m = momentum length scale, m,

L_b = buoyancy length scale, m,

R_o = stack exit radius, m,

V_o = stack exit velocity, m/s,

T_a = ambient temperature, K,

TABLE 1. TYPICAL COMBUSTION ANALYSIS--SHAWNEE STEAM PLANT[a]

Typical ambient air data

Ambient air temperature (°C)	Relative humidity (%)	Stack gas temperature (°C)	Excess air (%)
15.5	70.0	160.0	21.0

As-fired coal analysis (%)

Proximate	Ultimate
M = 8.2	H = 4.0
VM = 34.8	C = 59.5
FC = 35.5	N_2 = 1.1
ASH = 17.7	O = 5.6
SUL = 3.8	SUL = 3.8
Total = 100.0	ASH = 17.7
	M = 8.2
	Total = 100.0
Energy potential = 11,562 Btu/lb	

Moisture-free combustion analyses (g/kg)

Combustible constituents	Theoretical O needed for complete combustion
H = 40.4	For H = 323.0
C = 594.8	For C = 1,586.4
SUL = 38.0	For SUL = 38.0
	Total = 1,947.5
	Minus O already present in coal 56.4
	Total = 1,891.1

TABLE 1 (continued)

Air used in combustion (g/kg)	
Theoretical N_2 = 6,260.0	Theoretical air = 8,151.1
Theoretical O = 1,891.1	Excess air = 1,711.7
Theoretical air = 8,151.1	Total air = 9,862.8

Characteristics of the flue gas

Constituents	Grams of gas per kilogram of coal	Liters of gas per kilogram of coal at 160.0°C
H_2O	520.3	1,027.5
CO_2	2,181.3	1,762.0
N_2	11.4	14.4
SO_2	76.0	42.2
Theoretical N_2	6,260.0	7,946.5
Excess air	1,711.7	2,101.6
Total	10,760.8	12,894.2

Density at 150.0°C	Mean molecular weight	Gas constant (ℓ-atm/mole K)
0.8345 g/ℓ	29.7	0.00277

[a]Nomenclature: M = moisture; VM = volatile matter; FC = fixed carbon; ASH = fly ash; SUL = sulfur; H = hydrogen; N_2 = nitrogen; C = carbon; O = Oxygen; H_2O = water; CO_2 = carbon dioxide; SO_2 = sulfur dioxide.

T_o = stack exit temperature, K,

g = acceleration of gravity, 9.8 m/s^2,

$\bar{U}$ = wind speed averaged over plume environment, m/s.

The average stack exit conditions are presented in Section 4 (Table 2). On each hourly plume illustration presented in Appendix A, a bar graph shows the percent of full generation for each unit.

Time-Mean Plume Behavior

As described earlier, the plume was photographed under carefully controlled conditions every 2 min for a period of about 30 min. After development and slide identification, the plant name, date, and time were written on each slide. From the meteorological data, plume observations, and slides, a subperiod (usually 15 to 20 min) was selected for analysis. In cases of changing meteorological conditions, poor vantage point, or missing meteorological or source data, the entire 30-min sequence was omitted.

Slides from each photographic subperiod were projected onto a specially drafted sheet of paper mounted on a wall, and the outline of the plume from each slide was drawn on the sheet. At this stage special care was taken to ensure that (1) the slide and wall were parallel and the separation distance was accurately measured and recorded, (2) the focal length of the projector was recorded, and (3) the horizons and origins of all plume images were coincident. To help ensure that all slides in a photographic sequence were oriented in the same way, four special fiducial marks, similar to gun-sights, were constructed in the camera. These reference points, the same for all slides, were also traced. Also, a special mount for the slide projector, which allowed rapid and accurate alignment of each slide, was constructed from a surveyor's transit.

After all plume images in a given sequence were traced on the sheet, the estimated average top and bottom of the plume were drawn and digitized electronically. The origin of the tracing was fixed at the top of the center stack (plant center) at a stack height of 76 m. To reduce random errors, the same technicians reduced all the plume slides in the field study. This technique, which produced single, time-averaged plume outlines for each photographic period, is intended to provide the most accurate estimate of the centerline of the time-averaged plume. Estimated plume radius, particularly during cases of vigorous atmospheric mixing, may not accurately reflect the radius associated with plume rise modeling.

The mathematics of the procedure for reducing photographic data are presented in Appendix A of a report on plume rise data at Johnsonville Steam Plant.[6] Although the data reduction procedure is mathematically exact, the accuracy of the method relies strongly on the

geometric relationship between plume direction and location of the plant and camera stations. Locations of the camera stations relative to the plant are accurately known, but the plume direction, which may change, must be accurately determined for each photographic period. Plume direction was determined from (1) observations from the aircraft and helicopter and (2) the wind direction averaged over the plume environment. In general, the accuracy of computed plume trajectories decreases with increasing angle (β) of the plume with respect to the imaginary plane and with increasing wind-direction shear in the plume environment. These parameters and the plume direction are printed in Appendix A on tables of hourly plume observations. Plumes with values of β larger than about 35° or with questionable directions were removed from the data set.

Ambient Air Data

Presented in the center portion of the tables in Appendix A are the averaged profiles of potential temperature, lapse rate of potential temperature, dissipation of turbulent kinetic energy to the 1/3 power, wind speed, and wind direction. Averages over the plume environment of these meteorological variables are also presented in Section 4 (Table 2) and at the bottoms of the tables in Appendix A. Methods of data processing and tabulation are described below.

Wind Measurements

Wind profiles were obtained from standard, single-theodolite analyses or from dual-theodolite analysis using Thyer's[14] technique. For each plume observation, two wind profiles were averaged and tabulated as averages over consecutive, 50-m, vertical layers. In Appendix A, the observed averaged profiles of wind speed and direction are plotted at the centers of the computed 30-s layers. All wind directions are reported as plume direction, or the direction toward which the wind was blowing. Because two wind profiles were averaged, two identifying times are given.

Temperature and Turbulence Measurements

Profiles of temperature and dissipation of turbulent energy were read from strip chart records at elevation intervals of 33 m (100 ft). Turbulence data were not corrected for changes in atmospheric density. The resulting profiles are plotted at observed layers and are interpolated for tabulation at 50-m intervals. Stability gradients, also tabulated at 50-m intervals, were calculated from the original data. Because two sequential profiles were usually averaged, two identifying times are given.

4. SUMMARY OF PLUME OBSERVATIONS

Abbreviations and Symbols for Table 2

Time	Average time of the plume observation period
$\bar{U}$	Average wind speed from stack top to plume top, calculated from pibal data, m/s
Dir	Average plume direction from stack top to plume top, calculated from pibal data, degrees
T_a	Average atmospheric temperature from stack top to plume top, K
Gradients/100 m: $\bar{U}$, Dir, T_a	Gradients of the above three parameters
E	Average of the dissipation rate of atmospheric turbulence ($\varepsilon^{1/3}$) from stack top to plume top, calculated from aircraft data, $(cm^2/s^3)^{1/3}$
U_{ao}	Atmospheric wind speed at stack top, m/s
N	Number of stacks operating
T_e	Generation-weighted average stack exit temperature, K
V_e	Generation-weighted average stack exit velocity, m/s
F_m	Generation-weighted average flux of momentum, calculated from Equation (2), m^4/s^2
F_b	Generation-weighted average flux of buoyancy, calculated from Equation (3), m^4/s^3
L_m	Generation-weighted average length scale of momentum, calculated from Equation (4), m
L_b	Generation-weighted average length scale of buoyancy, calculated from Equation (5), m
X	Downwind coordinate of the most distant plume center point observed, m
Z	Height above reference stack of the most distant plume center point observed, m
R	Time-mean plume radius at the most distant point observed, m
Slope	Slope of the plume in the most distant region observed

TABLE 2. SUMMARY OF OBSERVATIONS OF THE PLUME, ITS SOURCE, AND METEOROLOGICAL CONDITIONS AT SHAWNEE STEAM PLANT, JULY-AUGUST 1973 AND OCTOBER-NOVEMBER 1974

Time	Meteorological conditions								Exit conditions							Observed rise			
	$\bar{U}$	Dir	T_a	Gradients/100 m			E	U_{ao}	N	T_e	V_e	F_m	F_b	L_m	L_b	X	Z	R	Slope
	(m/s)	(deg)	(K)	$\bar{U}$	Dir	T_a		(m/s)		(K)	(m/s)			(m)	(m)	(m)	(m)	(m)	
									July 19, 1973										
705	6.3	39	297	0.2	-1.3	2.03	0.0	6.2	10	434	18.5	1369	334	5.1	1.0	987	60	83	0.0
800	7.6	17	299	-0.9	5.6	1.02	0.0	7.5	10	435	18.6	1383	331	4.2	0.6	1030	83	67	0.0
900	5.8	261	301	0.5	2.8	0.31	0.0	5.4	10	436	18.7	1398	328	5.6	1.3	767	69	90	0.01
1000	7.1	261	301	0.7	1.1	0.36	0.0	6.2	10	436	18.6	1383	327	4.5	0.7	611	104	106	0.09
									July 20, 1973										
655	9.5	48	298	0.1	0.0	0.56	0.0	9.5	10	436	20.3	1648	368	3.7	0.3	736	42	50	0.02
755	7.1	334	298	1.9	16.0	0.81	0.0	5.8	10	437	19.3	1489	352	4.7	0.7	744	54	77	0.0
855	7.1	19	300	0.2	7.6	0.20	0.0	7.0	10	436	19.0	1444	337	4.6	0.7	314	63	85	0.13
955	6.4	27	301	1.0	6.6	0.11	0.0	5.3	10	437	18.8	1413	332	5.0	0.9	622	138	131	0.19
									July 26, 1973										
900	4.1	77	298	0.1	7.9	0.42	0.0	3.6	10	435	18.8	1413	338	7.9	3.7	2719	326	172	0.02
1100	5.9	98	300	0.5	1.1	0.21	0.0	4.7	10	435	17.9	1281	315	5.3	1.2	1871	390	345	0.08
1220	6.5	103	300	0.3	-1.9	0.19	0.0	5.2	10	435	18.0	1296	317	4.8	0.9	1972	252	224	0.0
									July 27, 1973										
755	3.6	105	297	0.4	-8.3	0.80	0.0	2.2	10	434	20.1	1616	363	9.6	5.7	4839	329	158	0.0
855	3.1	103	299	0.7	1.8	0.36	0.0	1.6	10	434	19.1	1459	338	10.7	8.7	5404	472	188	0.01
955	4.0	91	300	0.7	1.8	0.26	0.0	1.6	10	434	18.6	1383	325	7.9	3.7	6166	790	278	0.03
1055	4.0	91	300	0.7	1.8	0.26	0.0	1.6	10	435	18.6	1383	328	7.9	3.7	6846	832	368	0.04

TABLE 2 (continued)

Time	Meteorological conditions								Exit conditions							Observed rise			
	$\bar{U}$ (m/s)	Dir (deg)	T_a (K)	Gradients/100 m $\bar{U}$	Dir	T_a	E	U_{ao} (m/s)	N	T_e (K)	V_e (m/s)	F_m	F_b	L_m (m)	L_b (m)	X (m)	Z (m)	R (m)	Slope
									August 1, 1973										
855	4.2	155	294	1.0	-0.5	0.08	0.0	3.6	10	433	17.3	1197	320	7.1	3.1	362	148	135	0.27
1055	6.8	164	296	0.2	1.7	-0.01	0.0	6.2	10	432	17.2	1183	309	4.4	0.7	841	166	132	0.18
1155	8.2	128	297	0.6	-0.2	-0.09	0.0	7.1	10	432	17.3	1197	308	3.6	0.4	448	112	117	0.23
									August 2, 1973										
745	5.8	187	291	1.1	1.7	0.78	0.0	4.5	6	435	14.9	888	289	4.3	1.1	399	94	104	0.13
855	4.7	183	292	0.9	1.3	0.38	0.0	4.0	7	434	17.9	1281	341	6.5	2.4	440	146	131	0.28
955	4.7	185	293	0.2	-8.3	0.16	0.0	4.4	7	435	19.2	1474	364	7.0	2.6	287	83	91	0.17
1055	5.0	181	295	0.0	-8.9	-0.18	0.0	4.9	6	434	18.9	1428	349	6.4	2.0	505	145	123	0.27
									August 3, 1973										
755	5.4	190	293	0.4	6.5	1.26	0.0	4.4	10	431	15.6	973	288	5.0	1.3	689	136	114	0.12
855	4.1	164	295	0.3	2.6	0.53	0.0	3.3	10	434	18.0	1296	332	7.4	3.4	769	210	124	0.19
955	3.1	184	296	0.6	3.1	0.08	0.0	2.6	10	434	19.4	1505	354	10.7	8.6	327	164	159	0.31
1055	4.8	193	297	-0.3	-3.0	0.06	0.0	4.8	10	434	19.5	1521	352	7.0	2.4	691	297	222	0.41
1155	4.4	165	298	0.3	1.9	-0.01	0.0	2.9	10	434	19.5	1521	348	7.7	3.1	986	417	249	0.29
									August 7, 1973										
715	9.5	1	296	5.6	17.8	3.64	0.0	8.5	10	433	18.9	1428	342	3.4	0.3	843	53	47	0.0
800	8.4	93	297	-3.0	153.9	2.23	0.0	9.3	10	432	19.2	1474	342	4.0	0.4	886	68	60	0.02
900	9.9	8	298	0.3	18.8	1.10	0.0	9.8	10	433	19.0	1444	337	3.3	0.3	877	69	71	0.0
1000	6.4	22	301	0.9	2.3	0.14	0.0	5.2	10	433	19.3	1489	331	5.3	1.0	929	124	94	0.04
1050	9.6	16	302	-2.1	2.8	0.01	0.0	10.3	10	434	19.0	1444	325	3.4	0.3	332	93	118	0.28

TABLE 2 (continued)

Time	$\bar{U}$ (m/s)	Dir (deg)	T_a (K)	Gradients/100 m: $\bar{U}$	Gradients/100 m: Dir	Gradients/100 m: T_a	E	U_{ao} (m/s)	N	T_e (K)	V_e (m/s)	F_m	F_b	L_m (m)	L_b (m)	X (m)	Z (m)	R (m)	Slope
	Meteorological conditions								Exit conditions							Observed rise			
August 15, 1973																			
900	19.2	303	295	-3.4	-23.2	0.62	0.0	18.9	10	429	19.5	1521	347	1.7	0.0	1500	313	174	0.01
August 16, 1973																			
900	6.4	336	297	0.0	-2.4	0.67	0.0	5.7	10	433	18.7	1398	335	5.1	1.0	1897	191	157	0.02
1000	5.1	332	298	0.4	1.8	0.23	0.0	3.7	10	432	18.1	1310	319	6.2	1.8	1547	242	193	0.0
1100	3.6	324	299	0.0	-0.1	0.05	0.0	3.5	10	433	17.9	1281	314	8.5	4.9	1095	432	334	0.23
1200	2.8	317	300	0.1	2.2	0.02	0.0	2.6	10	434	18.0	1296	315	11.1	10.8	921	478	291	0.33
October 23, 1974																			
820	8.4	57	287	0.3	5.6	2.49	0.0	7.9	10	425	21.3	1814	401	4.3	0.5	2219	98	35	0.0
910	5.4	58	286	4.2	6.3	2.32	0.0	3.9	10	426	21.4	1831	410	6.7	1.9	782	78	92	0.0
1005	4.9	71	286	1.9	5.6	2.02	0.0	3.5	10	426	20.7	1713	397	7.2	2.4	274	117	123	0.19
1210	3.3	147	292	-1.1	0.0	0.13	0.0	4.2	10	427	20.1	1616	364	10.4	7.2	219	106	111	0.35
1300	3.1	49	296	0.0	6.6	0.01	0.0	3.3	10	427	20.5	1681	355	11.5	9.1	285	143	161	0.44
October 24, 1974																			
825	5.3	79	290	0.7	2.3	1.68	0.0	3.7	8	426	20.2	1632	371	6.6	1.9	1470	149	110	0.0
1005	3.9	57	290	0.5	-4.4	1.14	0.0	2.4	9	426	19.8	1568	363	8.7	4.5	1694	299	105	0.03
1110	3.3	45	293	0.7	-5.7	0.58	0.0	2.2	8	427	20.2	1632	362	10.6	7.7	1662	261	188	0.0

TABLE 2 (continued)

Time	Meteorological conditions: $\bar{U}$ (m/s)	Dir (deg)	T_a (K)	Gradients/100 m: $\bar{U}$	Dir	T_a	E	U_{ao} (m/s)	Exit conditions: N	T_e (K)	V_e (m/s)	F_m	F_b	L_m (m)	L_b (m)	Observed rise: X (m)	Z (m)	R (m)	Slope
									October 25, 1974										
810	7.6	71	291	0.5	7.4	1.90	0.0	6.3	9	425	19.8	1568	357	4.5	0.6	2255	129	79	0.0
910	7.1	64	292	-0.1	9.6	1.77	0.0	6.6	9	425	19.9	1584	355	4.8	0.7	1961	141	70	0.05
1010	5.7	74	293	0.4	8.1	1.10	0.0	4.0	9	426	20.0	1600	355	6.0	1.4	1638	185	144	0.02
									November 13, 1974										
805	9.5	7	278	2.7	8.4	2.10	3.7	8.3	7	419	19.9	1584	395	3.6	0.3	589	76	64	0.15
920	9.5	353	281	4.1	10.5	0.64	3.5	8.4	7	422	20.2	1632	397	3.6	0.3	603	53	91	0.01
1010	18.9	359	284	-6.2	0.6	0.04	5.0	18.7	7	421	19.8	1568	374	1.8	0.0	583	41	88	0.01
									November 14, 1974										
805	6.2	116	274	0.2	3.8	0.23	2.7	5.8	7	421	20.0	1600	420	5.4	1.2	1567	436	188	0.15
905	6.3	113	274	1.3	-2.6	0.20	3.4	4.3	7	420	19.9	1584	415	5.3	1.2	1294	276	167	0.15
									November 15, 1974										
805	8.3	61	276	3.8	6.8	0.66	3.6	7.9	5	422	20.7	1713	429	4.2	0.5	200	33	40	0.09
905	7.7	58	277	0.5	8.2	0.33	3.2	7.3	6	419	19.0	1444	381	4.2	0.6	211	45	48	0.17
									November 21 1974										
955	7.2	115	281	-0.7	-0.2	0.19	3.0	7.2	6	417	18.8	1413	356	4.4	0.7	797	122	116	0.10
1055	7.9	106	283	-3.1	4.8	0.05	3.7	9.0	6	419	18.5	1369	348	4.0	0.5	438	60	98	0.0

TABLE 2 (continued)

Time	Meteorological conditions								Exit conditions							Observed rise			
	$\bar{U}$ (m/s)	Dir (deg)	T_a (K)	Gradients/100 m $\bar{U}$	Gradients/100 m Dir	Gradients/100 m T_a	E	U_{ao} (m/s)	N	T_e (K)	V_e (m/s)	F_m	F_b	L_m (m)	L_b (m)	X (m)	Z (m)	R (m)	Slope
									December 5, 1974										
900	7.8	353	276	1.3	2.1	2.35	2.9	6.6	6	414	18.5	1369	362	4.0	0.5	839	68	47	0.07
955	6.2	3	278	1.1	5.7	1.66	2.9	5.0	6	416	18.4	1354	358	5.1	1.1	1041	150	81	0.02
1055	7.3	356	281	0.3	9.2	0.66	2.9	6.4	5	416	18.2	1324	342	4.3	0.6	935	221	173	0.06
1200	4.2	350	282	1.3	7.8	0.17	3.2	2.5	6	419	18.8	1413	358	7.7	3.6	659	157	200	0.0
1300	5.3	356	283	0.7	-1.3	0.20	3.3	4.7	6	418	18.6	1383	347	6.0	1.7	586	90	138	0.0

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APPENDIX A

TABULATION AND DISPLAY OF HOURLY PLUME RISE DATA

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Abbreviations and Symbols for Appendix A

X	Downwind coordinate, m
Z	Height above reference stack, m
R	Time-mean plume radius, m
CS#	Camera station number
BETA	Angle between the plume and the imaginary plane, degrees
DIR	Average plume direction from stack top to plume top, calculated from pibal data, degrees
ELEV	Elevation at which measurements were obtained, m
TEMP	Atmospheric potential temperature, °C
GRAD	Lapse rate of potential temperature, °C/100 m
E	Average of the dissipation rate of atmospheric turbulence ($\varepsilon^{1/3}$) from stack top to plume top, calculated from aircraft data, $(cm^2/s^3)^{1/3}$
SPEED	Wind speed, m/s
UBAR	Average wind speed from stack top to plume top, calculated from pibal data, m/s
DT/DZ	Lapse rate of potential temperature averaged from stack top to plume top, °C/100 m
TAO	Average atmospheric temperature from stack top to plume top, K
UAO	Atmospheric wind speed at stack top, m/s
TO	Temperature of air leaving stacks, K
VO	Velocity of air leaving stacks, m/s
FM	Generation-weighted average flux of momentum, calculated from Equation (2), m^4/s^2
FB	Generation-weighted average flux of buoyancy, calculated from Equation (3), m^4/s^3
LM	Generation-weighted average length scale of momentum, calculated from Equation (4), m
LB	Generation-weighted average length scale of buoyancy, calculated from Equation (5), m

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OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 7/19/73- 705 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 656 - 718 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
29	1	16	30	22	15	15
150	14	124	62	137	38	25
360	32	347	109	353	70	38
559	43	550	136	554	89	46
766	18	768	143	767	80	62
973	-22	1002	143	987	60	83
LR	LR	1202	140	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 8 BETA=-31 DIR= 33

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 705 - POTENTIAL TEMP (C)	AIRCRAFT - 705 - GRAD (DC/100M)	PIBALS 650& 705 SPEED (WIND TO) (M/S)	PIBALS 650& 705 DIR (DEG)
50	24.4	1.8	5.8	30
100	25.6	2.5	6.2	38
150	26.8	2.2	6.3	39
200	27.6	1.3	6.4	38
250-	28.2	1.0	6.5	37
300	28.6	0.5	7.0	38
350	28.8	0.3	7.3	40
400	28.8	0.2	7.3	42
450	29.1	0.4	7.3	43
500	29.1	0.0	7.3	43
550	29.1	0.0	7.1	43
600			6.6	43
650			6.6	41
700			6.5	40
750			6.3	40
800			6.4	40
850			6.3	40
TOWER	LR	LR	2.2	338

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	133	445
2	139	446
3	136	447
4	115	436
5	122	439
6	127	437
7	140	436
8	126	438
9	111	433
10	151	442

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X= 987(M)
Z= 60(M)
R= 83(M)
SLOPE=0.0

AVERAGED METEOROLOGICAL CONDITIONS

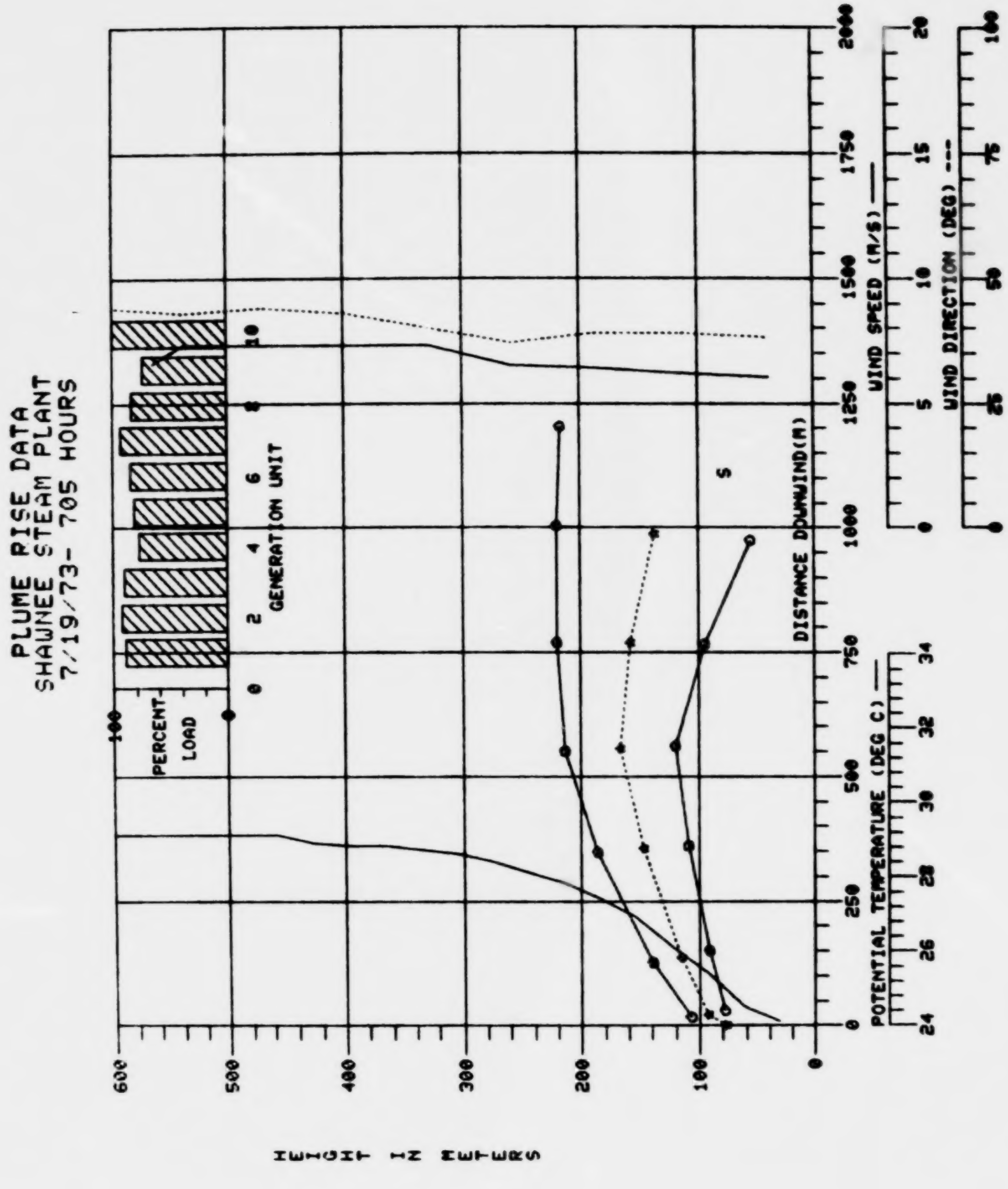
UNIT	1-4
UBAR (M/S)	6.3
DIR (DEG)	39
DT/DZ(C/100M)	2.03
UA0 (M/S)	6.2
TA0 (K)	297

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.2	-1.4

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	434
V0 (M/S)	14.5
FM (M4/S2)	624
FB (M4/S3)	194
LM (M)	4.0
LB (M)	0.8
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
7/19/73- 705 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
POTENTIAL TEMPERATURE (DEG C)
WIND SPEED (M/S)
WIND DIRECTION (DEG)
HEIGHT IN METERS

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 7/19/73- 800 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 746 - 820 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
23	-2	18	26	20	12	13
106	0	95	53	100	26	26
239	6	228	81	233	43	37
385	13	383	117	384	65	51
533	23	533	135	533	79	55
672	25	673	144	672	84	59
815	18	815	151	815	84	66
927	16	928	154	927	85	68
1031	15	1029	151	1030	83	67
LR	LR	1139	145	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 8 BETA=-23 DIR= 25

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 837 - POTENTIAL TEMP (C)	AIRCRAFT GRAD (DC/100M)	PIBALS 745& 805 SPEED (M/S)	DIR (WIND TO) (DEG)
50	25.9	0.3	4.1	343
100	26.3	1.2	7.4	9
150	26.9	0.8	8.0	19
200	27.3	1.0	7.4	23
250	27.9	1.3	7.0	24
300	28.5	0.9	6.9	26
350	28.8	0.4	6.7	28
400	28.9	0.3	6.4	30
450	29.0	0.1	5.8	35
500	29.1	0.3	5.6	39
550	29.3	1.2	5.4	42
600			5.0	46
650			4.8	47
700			4.5	47
750			4.4	49
800			4.8	51
850			4.9	49
TOWER	LR	LR	1.8	360

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	120	443
2	132	441
3	148	446
4	119	437
5	134	443
6	126	438
7	139	438
8	127	440
9	111	434
10	150	443

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X=1030(M)
Z= 83(M)
R= 67(M)
SLOPE=0.0

AVERAGED METEOROLOGICAL CONDITIONS

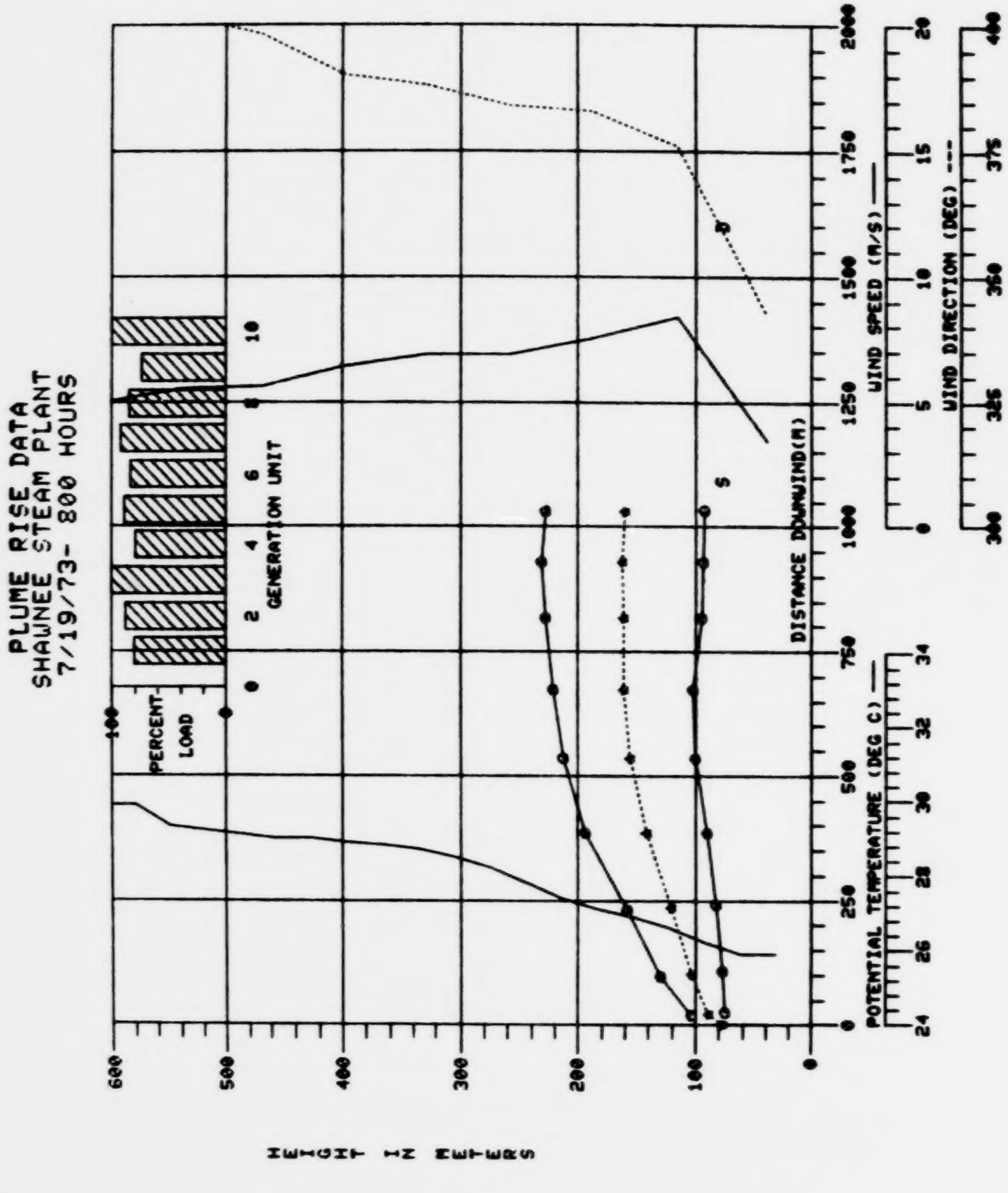
UNIT	1-4
UBAR (M/S)	7.6
DIR (DEG)	17
DT/DZ(C/100M)	1.02
UA0 (M/S)	7.5
TA0 (K)	299

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
-1.0	5.6

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	435
VO (M/S)	14.6
FM (M4/S2)	634
FB (M4/S3)	193
LM (M)	3.3
LB (M)	0.4
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
7/19/73- 800 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
POTENTIAL TEMPERATURE (DEG C) ——
WIND SPEED (M/S) ——
WIND DIRECTION (DEG) ---
HEIGHT IN METERS

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 7/19/73- 900 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 846 - 920 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
23	-5	7	23	15	9	16
84	-6	65	50	74	22	29
191	-10	166	91	178	40	51
315	-16	301	130	308	57	73
464	-21	456	154	460	66	87
622	-25	619	159	620	67	91
767	-22	767	160	767	69	90

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 8 BETA=-18 DIR= 25

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 922 - POTENTIAL TEMP (C)	AIRCRAFT - 922 - GRAD (DC/100M)	PIBALS 845& 900 SPEED (WIND TO) (M/S)	PIBALS 845& 900 DIR (WIND TO) (DEG)
50	27.9	1.1	4.9	264
100	28.1	0.0	5.4	260
150	28.2	0.2	5.7	261
200	28.3	0.5	6.0	261
250	28.8	1.5	6.2	264
300	29.3	0.3	6.3	266
350	29.4	-0.2	6.2	268
400	29.2	0.1	6.1	270
450	29.4	0.3	6.0	271
500	29.5	-0.1	5.8	273
550	29.4	0.2	5.7	274
600	29.6	0.3	5.5	273
650			5.1	273
700			4.6	275
750			4.4	278
800				
850				
TOWER	LR	LR	1.8	360

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	121	442
2	137	441
3	153	455
4	120	436
5	135	439
6	117	438
7	128	439
8	129	441
9	115	433
10	154	445

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X= 767(M)
Z= 69(M)
R= 90(M)
SLOPE=0.01

AVERAGED METEOROLOGICAL CONDITIONS

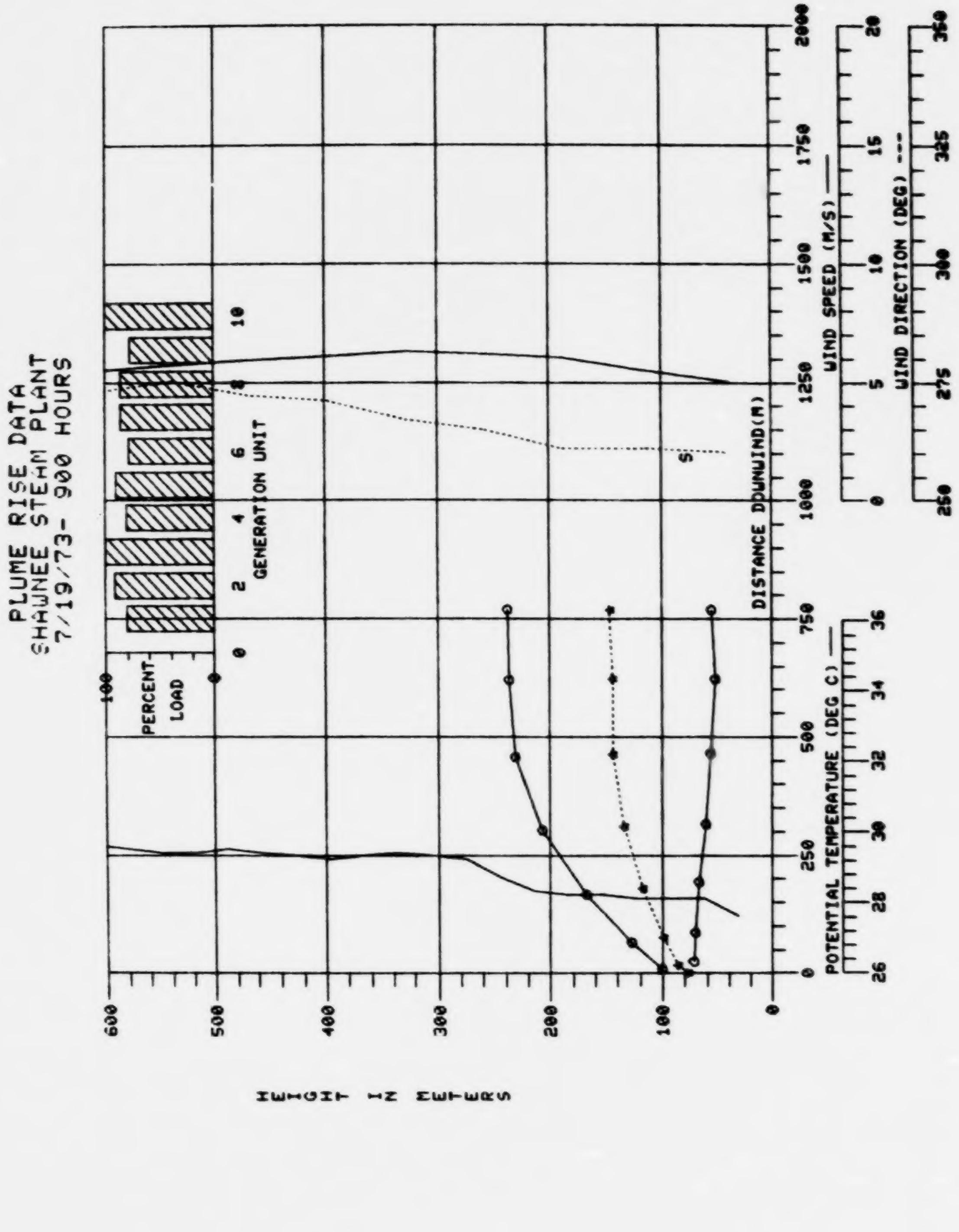
UNIT	1-4
UBAR (M/S)	5.8
DIR (DEG)	261
DT/DZ(C/100M)	0.31
UA0 (M/S)	5.4
TA0 (K)	301

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.5	2.8

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	436
VO (M/S)	14.7
FM (M4/S2)	645
FH (M4/S3)	193
LM (M)	4.4
LB (M)	1.0
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
7/19/73- 900 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
WIND SPEED (M/S)
WIND DIRECTION (DEG)
POTENTIAL TEMPERATURE (DEG C)

OBSERVED PLUME RISE AND ATMOSPHERIC DATA

SHAWNEE STEAM PLANT 7/19/73-1000 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 946 - 1020 HOURS

BOTTOM		TOP		CENTER		
X (M)	Z (M)	X (M)	Z (M)	X (M)	Z (M)	R (M)
21	1	9	22	15	11	11
66	-4	54	48	60	22	26
154	-10	141	87	147	38	49
273	-14	252	134	262	69	74
384	-7	372	168	378	80	87
501	-7	492	146	496	94	101
616	-2	607	211	611	104	106

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CSN= 8 BETA=-18 DIR= 25

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 1015 - POTENTIAL TEMP (C)	AIRCRAFT - 1015 - GRAD (DC/100M)	PIBALS 945&1005 SPEED (M/S)	PIBALS 945&1005 DIR (WIND TO) (DEG)
50	28.3	0.3	5.8	257
100	28.4	0.2	6.1	257
150	28.1	-0.6	6.9	260
200	28.3	0.8	7.7	262
250	28.9	1.0	7.6	262
300	29.1	0.0	7.7	262
350	29.2	0.1	8.0	263
400	29.0	-0.1	8.2	266
450	29.1	0.0	8.1	268
500	29.1	0.0	7.6	270
550	29.2	0.2	6.8	271
600			5.9	271
650			5.4	272
700			5.2	274
750			5.0	276
800			5.0	277
850			5.1	278
TOWER	LR	LR	2.7	23

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	120	444
2	137	442
3	152	454
4	117	436
5	135	440
6	118	438
7	121	439
8	129	444
9	115	434
10	154	444

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X= 611(M)
Z= 104(M)
R= 106(M)
SLOPE=0.09

AVERAGED METEOROLOGICAL CONDITIONS

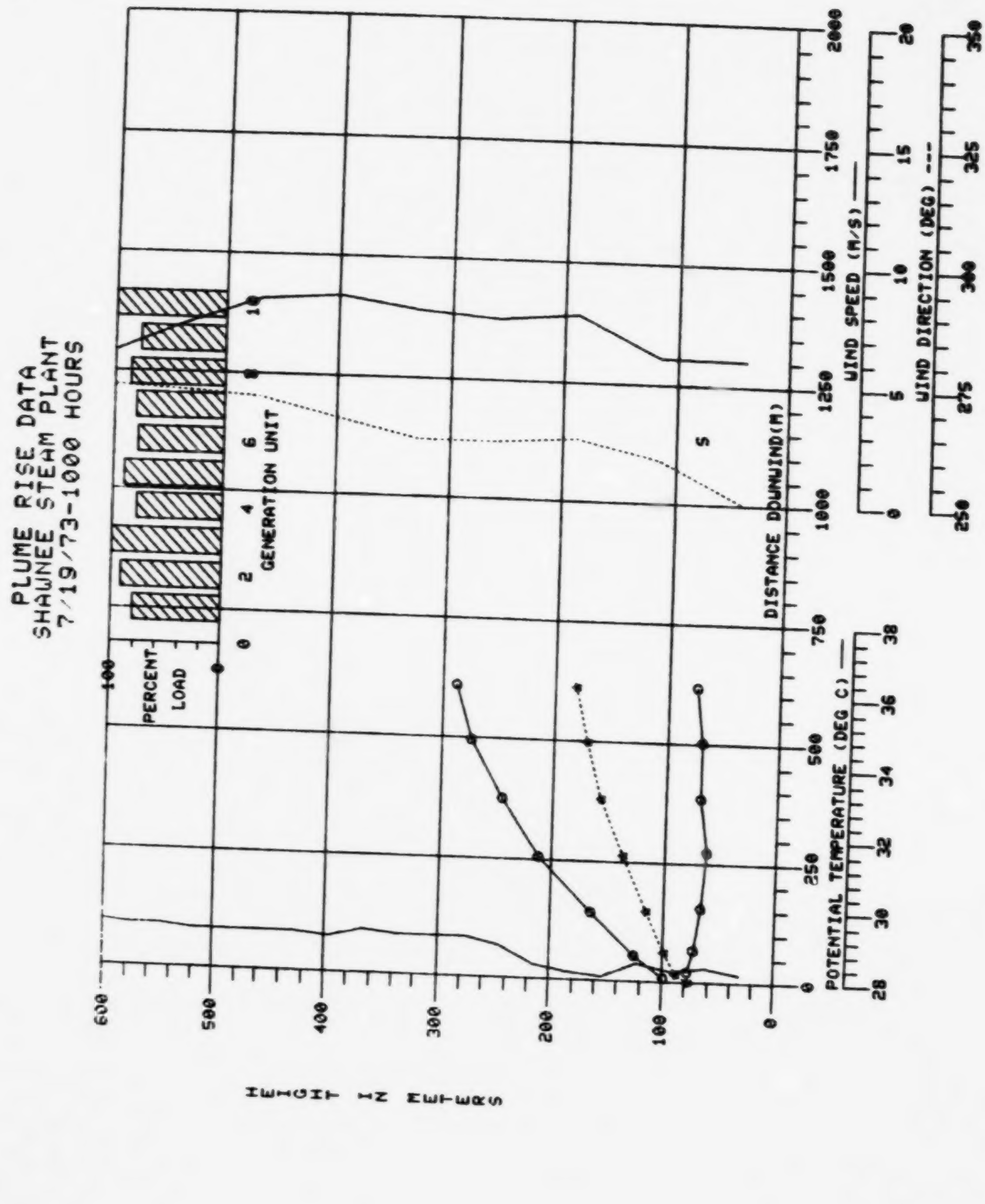
UNIT	1-4
UBAR (M/S)	7.1
DIR (DEG)	261
DT/DZ(C/100M)	0.36
UAO (M/S)	5.2
TAU (K)	301

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.7	1.1

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	436
VO (M/S)	14.6
FM (M4/S2)	637
FB (M4/S3)	191
LM (M)	3.5
LB (M)	0.5
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
7/19/73-1000 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
POTENTIAL TEMPERATURE (DEG C)
WIND SPEED (M/S)
WIND DIRECTION (DEG)
HEIGHT IN METERS

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 7/20/73- 655 HOURS

PHOTOGRAPHIC DETERMINATIONS OF
RELATIVE RISE - TOP & BOTTOM
VS X FOR 640 - 714 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
21	-2	15	19	18	8	10
60	-7	57	29	58	11	17
125	-10	124	41	124	15	25
206	-12	204	53	205	20	32
311	-12	309	65	310	26	38
402	-12	401	72	401	30	41
501	-10	500	85	500	37	47
602	-11	599	89	600	39	50
737	-9	736	93	736	42	50
LR	LR	892	95	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN
STACKS 4 AND 5
CS#= 8 BETA=-10 DIR= 20

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT 752 & 805 TEMP (C)	POTENTIAL GRAD (DC/100M)	PIBALS 645& 700 SPEED (M/S)	DIR (WIND TO) (DEG)
50	25.6	0.6	9.0	44
100	25.8	0.4	9.5	47
150	26.1	0.8	9.5	48
200	26.7	1.4	9.7	48
250	27.4	2.4	9.9	49
300	28.6	1.2	9.9	51
350	29.0	0.5	9.7	53
400	29.1	0.0	9.4	56
450	29.2	0.4	9.2	58
500	29.4	0.5	9.0	61
550	29.7	0.5	8.7	63
600	29.9	0.4	8.5	64
650	30.0	0.0	8.5	64
700	30.1	0.2	8.4	64
750	30.1	0.0	8.2	62
800	30.2	0.6	8.1	60
850	30.5	0.2	7.9	59
TOWER	24.7	1.6	2.7	23

GENERATION AND
PREHEATER EXIT
TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	146	443
2	149	440
3	152	452
4	150	445
5	139	440
6	141	443
7	148	439
8	130	440
9	154	438
10	146	441

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X= 736(M)
Z= 42(M)
R= 50(M)
SLOPE=0.02

AVERAGED METEOROLOGICAL CONDITIONS

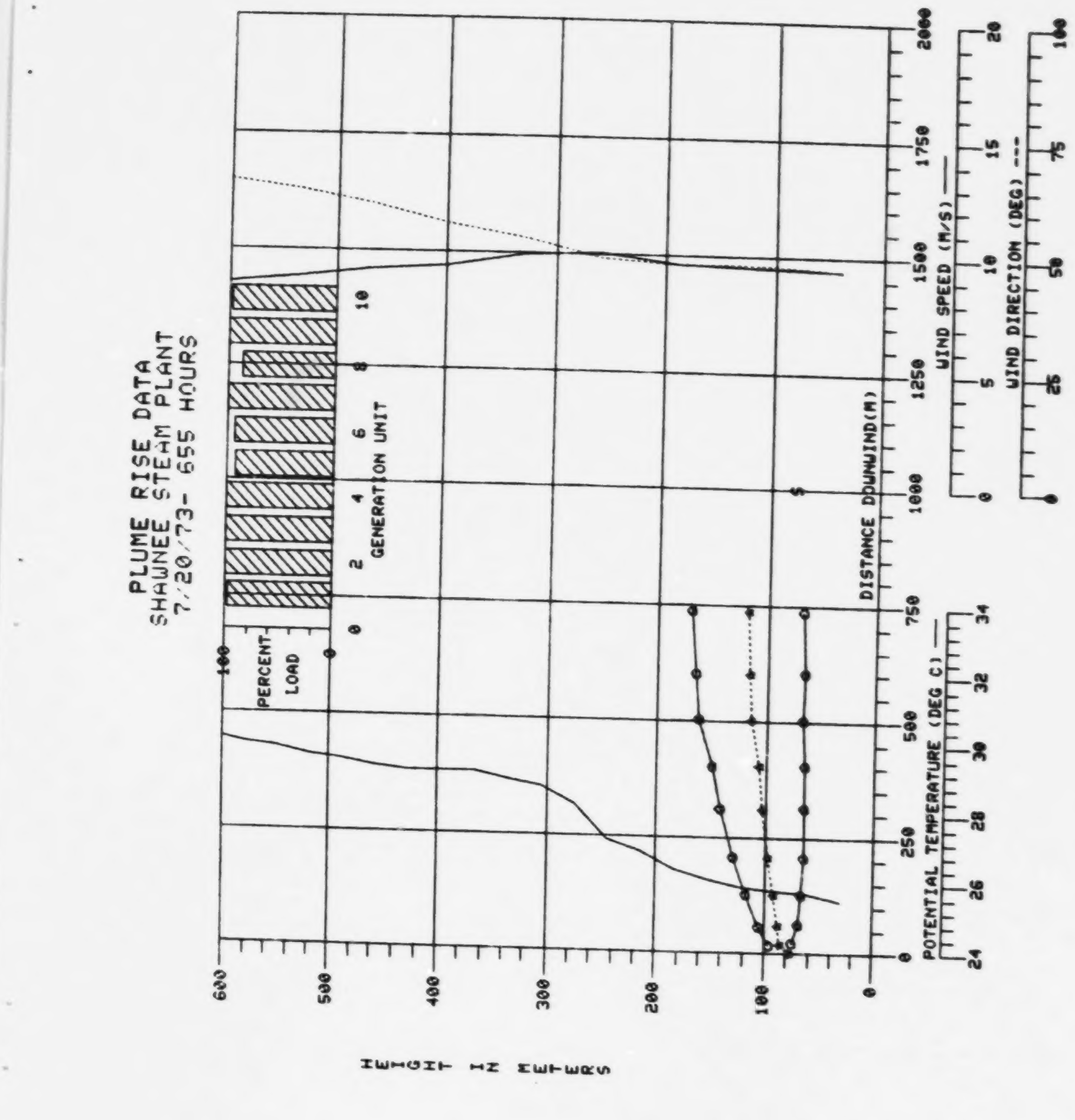
UNIT	1-4
UBAR (M/S)	9.5
DIR (DEG)	48
DT/DZ (C/100M)	0.56
UAG (M/S)	[illegible].5
TAU (K)	298

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.1	0.0

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	436
VO (M/S)	16.1
FM (M4/S2)	769
FB (M4/S3)	216
LM (M)	2.9
LB (M)	0.3
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
7/20/73- 655 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
WIND SPEED (M/S)
WIND DIRECTION (DEG) ---
POTENTIAL TEMPERATURE (DEG C)
HEIGHT IN METERS

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 7/20/73- 755 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 741 - 815 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
23	-2	12	25	17	11	14
78	-6	67	48	72	21	27
150	-12	144	64	147	26	38
245	-15	244	83	244	34	48
363	-17	360	104	361	43	60
485	-18	466	123	485	52	70
590	-17	537	130	566	56	73
745	-23	744	132	744	54	77

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 8 BETA=-15 DIR= 25

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT 752 & 805 POTENTIAL TEMP (C)	AIRCRAFT 752 & 805 GRAD (DC/100M)	PIBALS 745& 800 SPEED (WIND TO) (M/S)	PIBALS 745& 800 DIR (WIND TO) (DEG)
50	25.6	0.6	7.3	328
100	25.8	0.4	7.9	329
150	26.1	0.8	8.3	333
200	26.7	1.4	8.7	340
250	27.4	2.4	8.8	350
300	28.6	1.2	8.9	354
350	29.0	0.5	6.3	394
400	29.1	0.0	10.9	462
450	29.2	0.4	66.7	449
500	29.4	0.5	63.3	485
550	29.7	0.5	27.4	428
600	29.9	0.4	10.5	78
650	30.0	0.0	7.1	8
700	30.1	0.2	7.0	9
750	30.1	0.0	6.8	7
800	30.2	0.6	6.7	5
850	30.5	0.2	6.6	4
TOWER	26.1	1.0	2.7	23

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	107	444
2	149	440
3	149	453
4	154	443
5	115	440
6	127	446
7	113	436
8	129	441
9	155	439
10	147	441

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X= 744(M)
Z= 54(M)
R= 77(M)
SLOPE=0.0

AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	8.3
DIR (DEG)	334
DT/DZ(C/100M)	0.31
U40 (M/S)	7.9
TA0 (K)	298

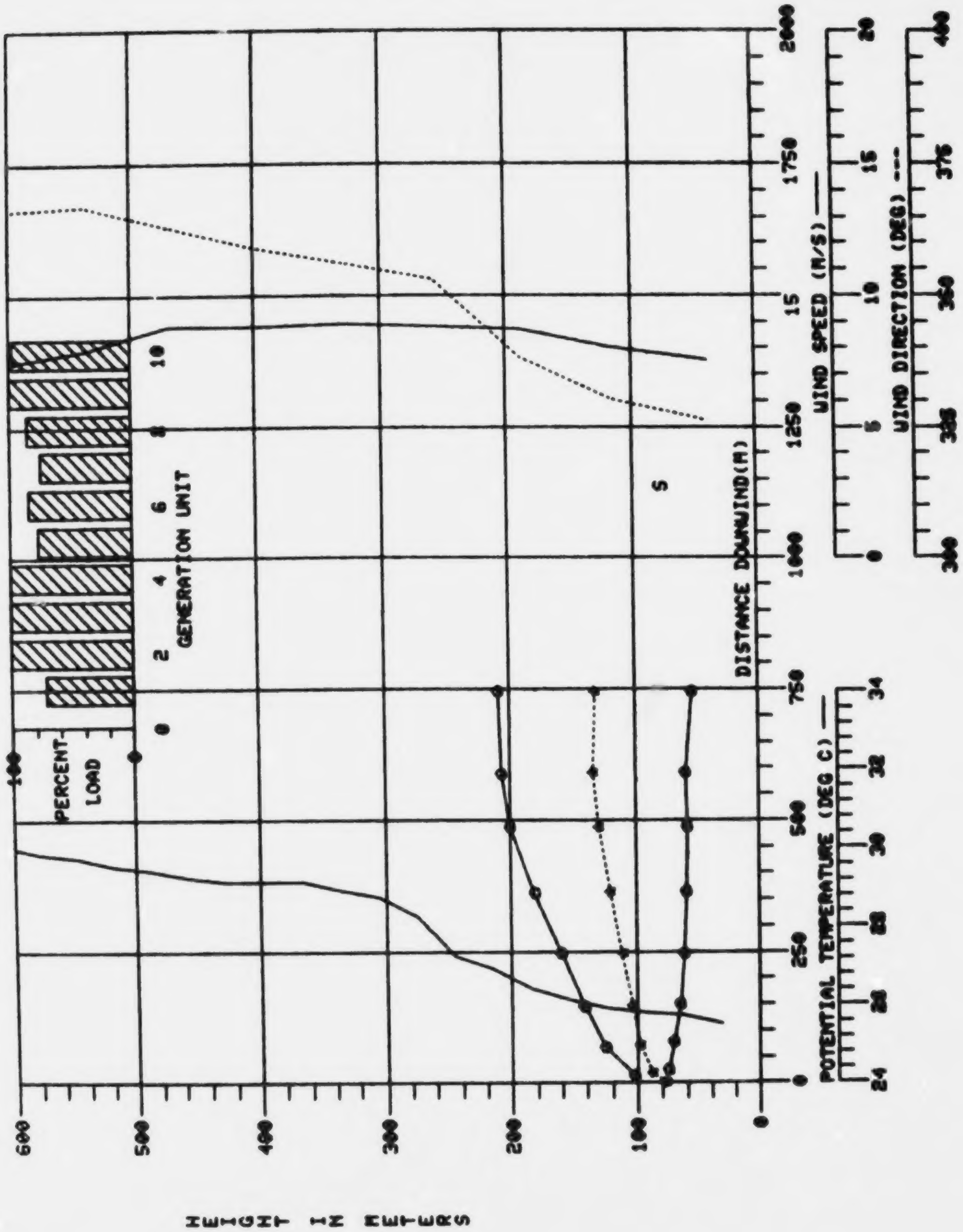
WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.6	16.0

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	437
VO (M/S)	15.2
FM (M4/S2)	681
FR (M4/S3)	205
LM (M)	3.2
LB (M)	0.4
NO.STACKS	10

PLUME RISE DATA
SHAWNEE STEAM PLANT
7/20/73- 755 HOURS



OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT   7/20/73- 855 HOURS

PHOTOGRAPHIC DETERMINATIONS OF
RELATIVE RISE - TOP & BOTTOM
VS X FOR 840 - 914 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
18	-3	5	24	11	10	14
63	-6	50	47	56	20	27
136	-13	113	83	124	35	49
212	-18	198	117	205	49	67
323	-22	305	149	314	63	85
LR	LR	424	178	----	---	---
LR	LR	635	214	----	---	---
LR	LR	872	219	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN
STACKS 4 AND 5
CS#= 8 BETA=-15 DIR= 25

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT 842 & 900 TEMP (C)	AIRCRAFT 842 & 900 POTENTIAL GRAD (DC/100M)	PIBALS 845& 900 SPEED (M/S)	PIBALS 845& 900 DIR (WIND TO) (DEG)
50	27.2	0.7	6.7	12
100	27.3	-0.2	7.0	16
150	27.3	0.3	7.1	18
200	27.5	0.5	7.2	21
250	27.6	0.0	7.4	28
300	27.8	0.5	8.4	36
350	28.1	1.0	9.2	42
400	28.7	1.3	9.3	46
450	29.1	0.6	9.5	47
500	29.4	0.5	9.4	48
550	29.6	0.2	9.0	48
600	29.7	0.5	8.5	48
650	29.9	-0.1	8.1	50
700	29.9	0.3	7.8	51
750	30.0	0.0	7.7	53
800	30.0	0.0	7.8	55
850	30.2	0.2	7.5	54
TOWER	27.7	-0.2	3.1	23

GENERATION AND
PREHEATER EXIT
TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	96	441
2	149	440
3	150	454
4	154	445
5	103	434
6	116	444
7	102	435
8	126	444
9	155	440
10	148	441

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X= 314(M)
Z= 63(M)
R= 85(M)
SLOPE=0.13

AVERAGED METEOROLOGICAL CONDITIONS

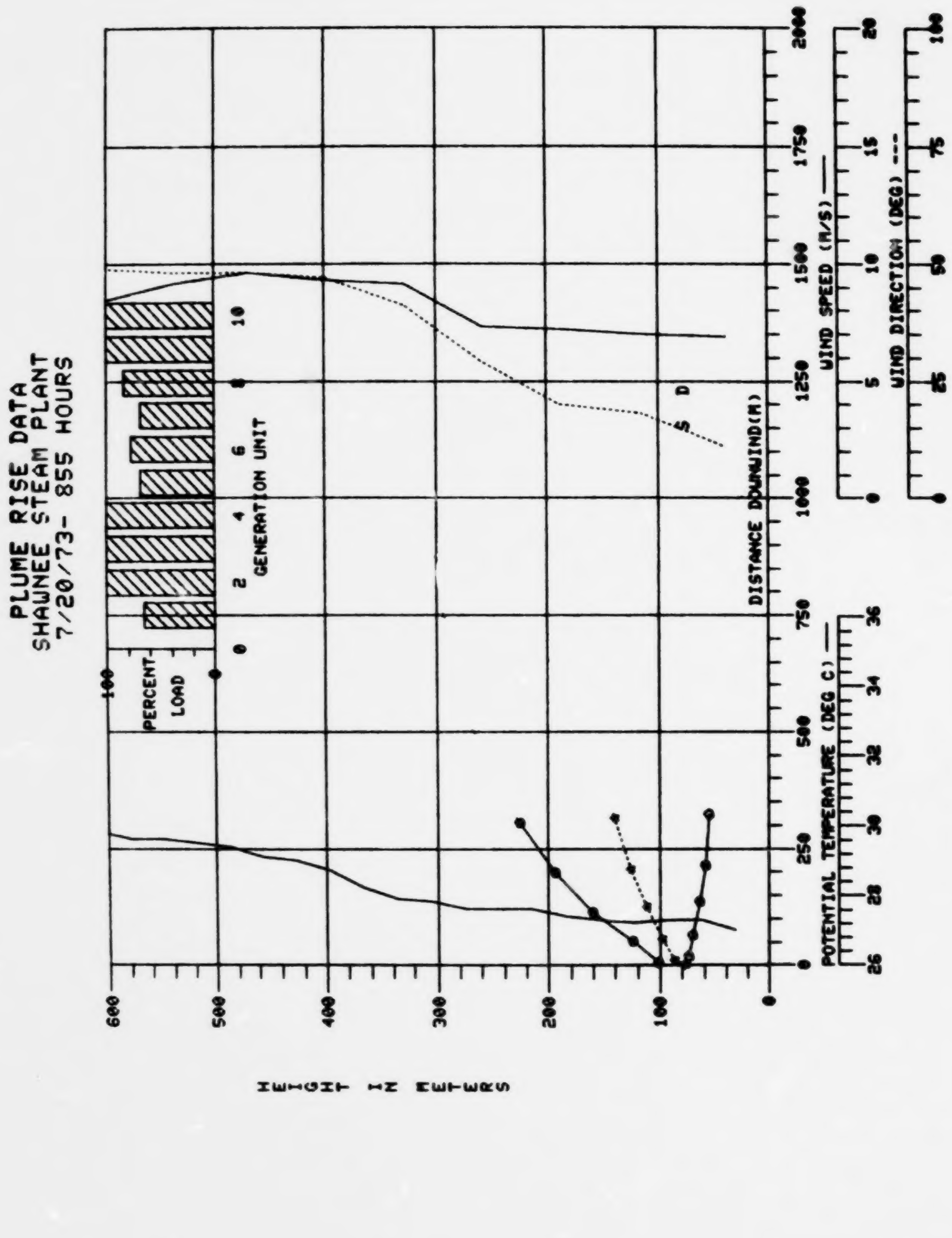
UNIT	1-4
UBAR (M/S)	7.1
DIR (DEG)	19
DT/DZ(C/100M)	0.20
UA0 (M/S)	7.0
TA0 (K)	300

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.2	7.6

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	436
VO (M/S)	14.9
FM (M4/S2)	660
FB (M4/S3)	197
LM (M)	3.6
LB (M)	0.6
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
7/20/73- 855 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
POTENTIAL TEMPERATURE (DEG C)
WIND SPEED (M/S)
WIND DIRECTION (DEG)
S
D

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 7/20/73- 955 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 941 - 1015 HOURS

BOTTOM		TOP		CENTER		
X	Z	X	Z	X	Z	R
(M)	(M)	(M)	(M)	(M)	(M)	(M)
25	-3	9	24	17	10	15
107	-4	82	68	94	32	37
238	-7	202	120	220	56	65
379	-10	330	169	354	79	92
515	2	469	224	492	113	113
649	10	595	267	622	138	131

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 8 BETA=-20 DIR= 30

TEMPERATURE AND WIND PROFILES

ELEV	AIRCRAFT - 1000 - POTENTIAL TEMP	GRAD	PIBALS 945&1005 SPEED (WIND	DIR TO)
(M)	(C)	(DC/100M)	(M/S)	(DEG)
50	28.1	0.1	4.6	16
100	28.1	-0.4	5.2	20
150	28.3	0.1	5.7	22
200	28.0	0.3	6.3	25
250	28.3	0.2	6.9	29
300	28.1	0.1	7.5	32
350	28.4	-0.0	7.9	35
400	28.4	0.3	8.2	39
450	28.7	1.0	8.1	42
500	29.3	0.9	8.2	44
550	29.6	0.5	8.3	45
600	29.8	0.3	8.1	46
650	29.9	-0.1	8.0	46
700	29.7	0.1	7.8	47
750	30.0	0.5	7.6	47
800	30.1	0.2	7.6	48
850	30.2	0.1	7.3	49
TOWER	29.4	-0.2	2.7	23

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD	TEMP
	(MW)	(K)
1	98	443
2	145	443
3	144	454
4	151	446
5	103	433
6	114	443
7	103	435
8	128	443
9	155	444
10	143	441

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X= 622(M)
Z= 138(M)
R= 131(M)
SLOPE=0.19

AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	6.4
DIR (DEG)	27
DT/DZ(C/100M)	0.11
UA0 (M/S)	5.3
TA0 (K)	301

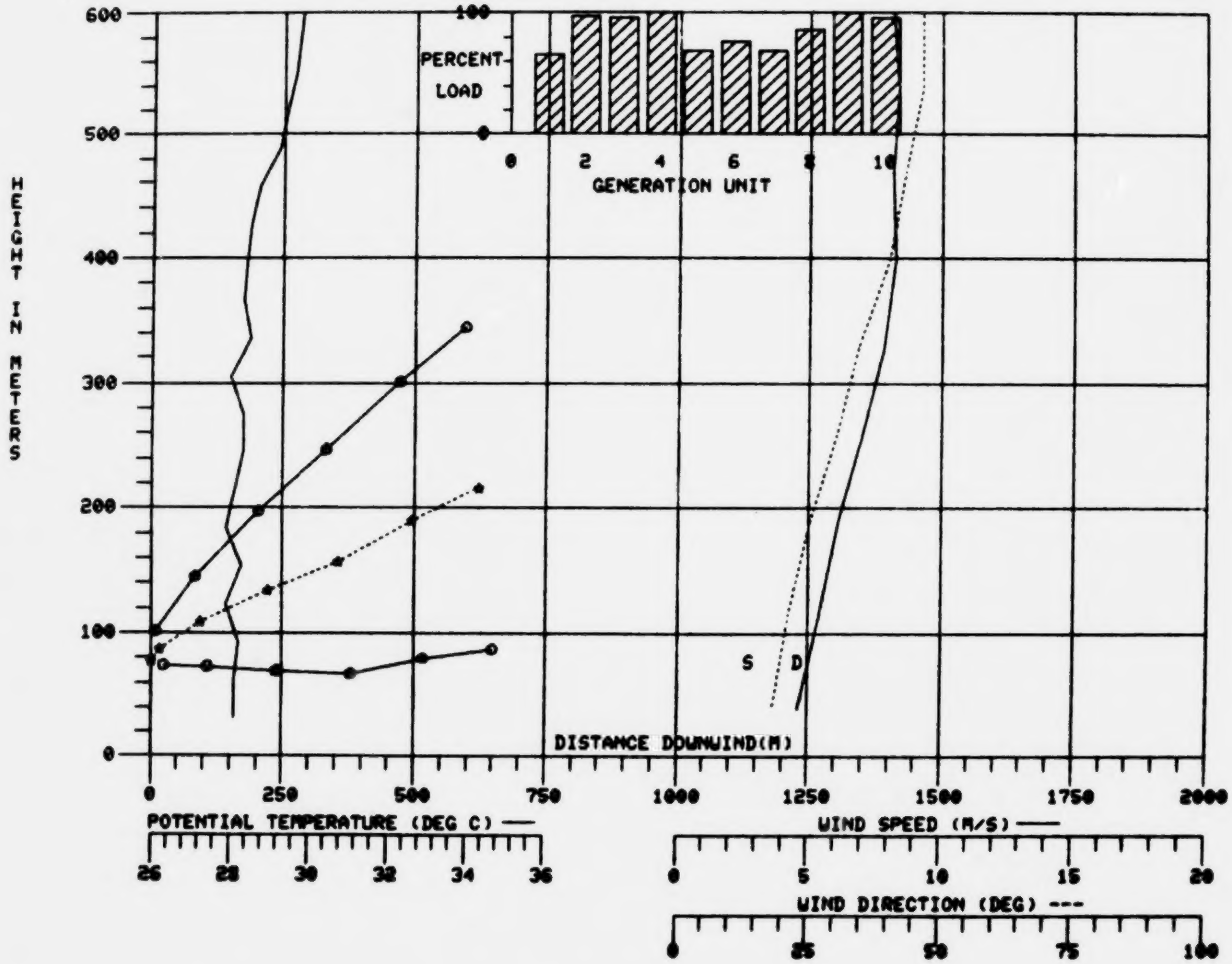
WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
1.0	6.6

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	437
VO (M/S)	14.7
FM (M4/S2)	644
FB (M4/S3)	194
LM (M)	3.9
LB (M)	0.7
NO.STACKS	10

PLUME RISE DATA
SHAWNEE STEAM PLANT
7/20/73- 955 HOURS



OBSERVED PLUME RISE AND ATMOSPHERIC DATA

SHAWNEE STEAM PLANT 7/26/73- 900 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 845 - 919 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
56	3	35	49	45	26	25
196	13	165	107	180	60	49
544	16	497	284	520	150	135
918	35	875	415	896	225	190
1474	85	1472	459	1473	272	186
2205	130	2207	500	2206	315	184
2710	154	2728	499	2719	326	172

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5

CS#= 3 BETA=-13 DIR= 75

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 910 - POTENTIAL TEMP (C)	AIRCRAFT - 910 - GRAD (DC/100M)	PIBALS 855& 905 SPEED (M/S)	PIBALS 855& 905 DIR (WIND TO) (DEG)
50	25.7	0.7	3.1	64
100	25.6	-0.2	3.6	64
150	25.7	0.0	3.8	64
200	25.6	0.0	3.9	65
250	25.7	0.1	4.1	66
300	25.8	1.3	4.2	69
350	26.8	1.3	4.2	74
400	27.1	0.3	4.1	82
450	27.2	0.4	4.1	88
500	27.5	0.8	4.3	92
550	27.8	0.2	4.5	96
600	27.8	0.2	4.6	97
650	28.0	0.4	5.3	99
700	28.1	0.5	6.2	100
750	28.5	0.5	6.8	100
800	28.7	0.4	6.8	100
850	29.0	0.7	6.5	99
TOWER	25.0	-1.1	2.2	90

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	136	443
2	113	433
3	147	447
4	138	440
5	121	443
6	109	437
7	132	439
8	128	444
9	147	439
10	146	440

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X=2719(M)

Z= 326(M)

R= 172(M)

SLOPE=0.02

AVERAGED METEOROLOGICAL CONDITIONS

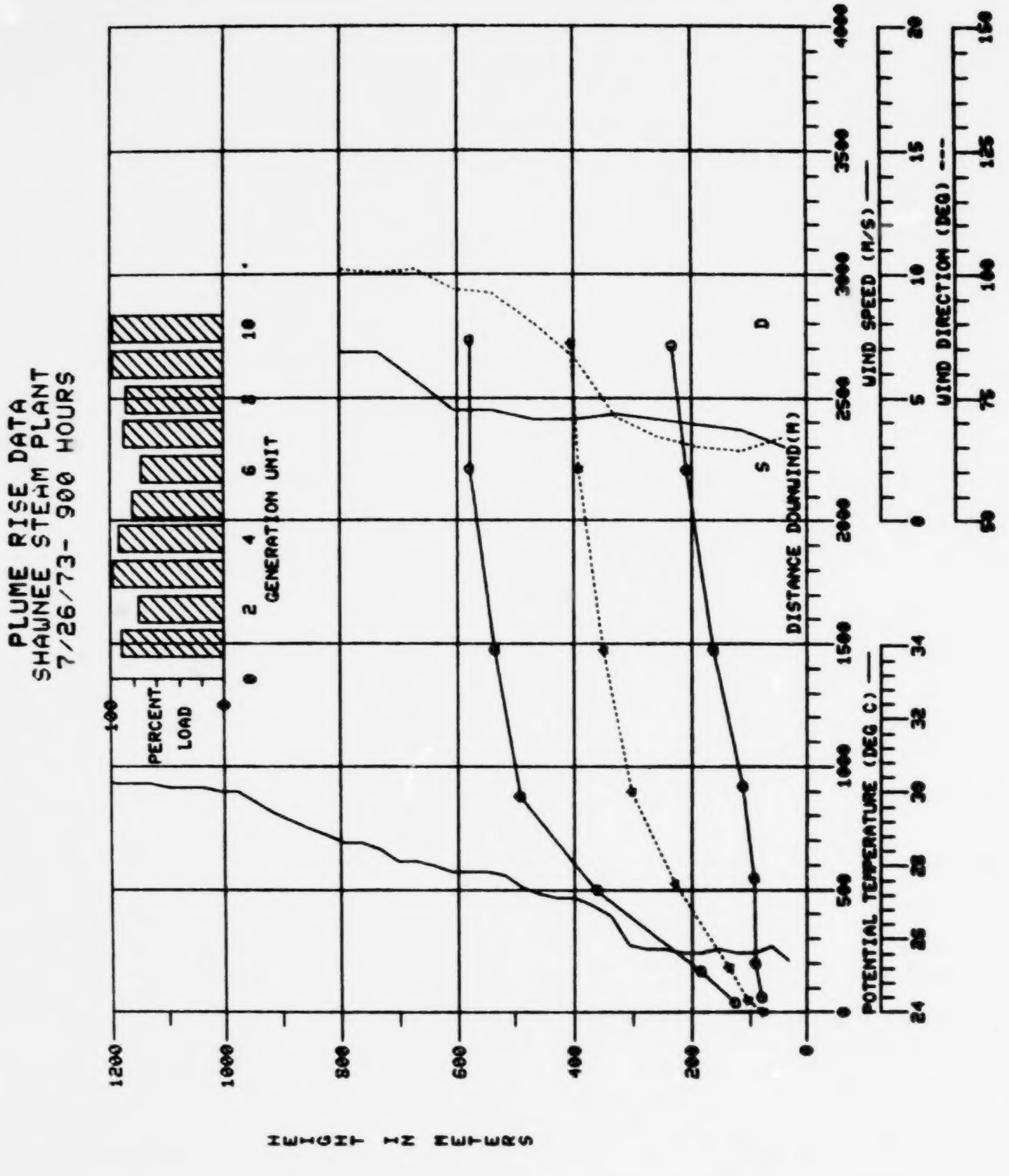
UNIT	1-4
UBAR (M/S)	4.1
DIR (DEG)	77
DT/DZ(C/100M)	0.42
UA0 (M/S)	3.6
TA0 (K)	298

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.1	7.9

AVERAGE EXIT CONDITIONS

UNIT	1-4
T0 (K)	435
V0 (M/S)	14.7
FM (M4/S2)	644
FB (M4/S3)	196
LM (M)	6.2
LB (M)	2.9
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
7/26/73- 900 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
POTENTIAL TEMPERATURE (DEG C)
WIND SPEED (M/S)
WIND DIRECTION (DEG)
HEIGHT IN METERS

OBSERVED PLUME RISE AND ATMOSPHERIC DATA

SHAWNEE STEAM PLANT 7/26/73-1100 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 1046 - 1118 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
39	-5	13	38	26	16	24
212	7	172	146	192	76	72
373	22	308	234	340	128	110
510	26	455	338	482	182	157
715	20	689	461	702	240	217
1067	21	1029	593	1048	307	284
1452	32	1443	682	1447	357	323
1872	44	1871	737	1871	390	345
LR	LR	2385	764	----	---	---
LR	LR	2896	793	----	---	---
LR	LR	3444	822	----	---	---
LR	LR	3924	832	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5

CS#= 3 BETA= 1 DIR= 95

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 1010 - POTENTIAL TEMP (C)	AIRCRAFT - 1010 - POTENTIAL GRAD (DC/100M)	PIBALS 1045&1100 SPEED (WIND TO) (M/S)	PIBALS 1045&1100 DIR (WIND TO) (DEG)
50	27.2	-0.6	5.1	98
100	27.1	-0.3	4.7	95
150	27.0	-0.1	4.7	94
200	26.8	-0.4	4.9	94
250	26.6	-0.0	5.0	94
300	26.6	-0.3	4.8	95
350	26.6	0.6	4.7	96
400	27.2	1.3	5.0	97
450	27.7	0.9	5.4	98
500	27.8	-0.7	5.9	99
550	27.5	0.7	6.3	100
600	28.1	0.6	6.9	101
650	28.3	0.3	7.1	101
700	28.5	0.5	7.3	101
750	28.7	0.1	7.6	100
800	28.7	0.0	8.0	100
850	28.7	0.1	8.3	100
900	28.7	-0.1	8.8	98
950	29.0	0.7	9.2	96
1000	29.2	0.3	9.4	94
1050	29.4	0.4	8.7	91
1100	29.6	0.7	8.7	91
TOWER	2[illegible].7	-2.3	2.7	113

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	110	434
2	124	435
3	149	452
4	125	443
5	115	438
6	107	436
7	120	441
8	129	443
9	130	440
10	136	441

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X=1871(M)
Z= 390(M)
R= 345(M)
SLOPE=0.08

AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	5.9
DIR (DEG)	98
DT/DZ(C/100M)	0.21
UA0 (M/S)	4.7
TA0 (K)	300

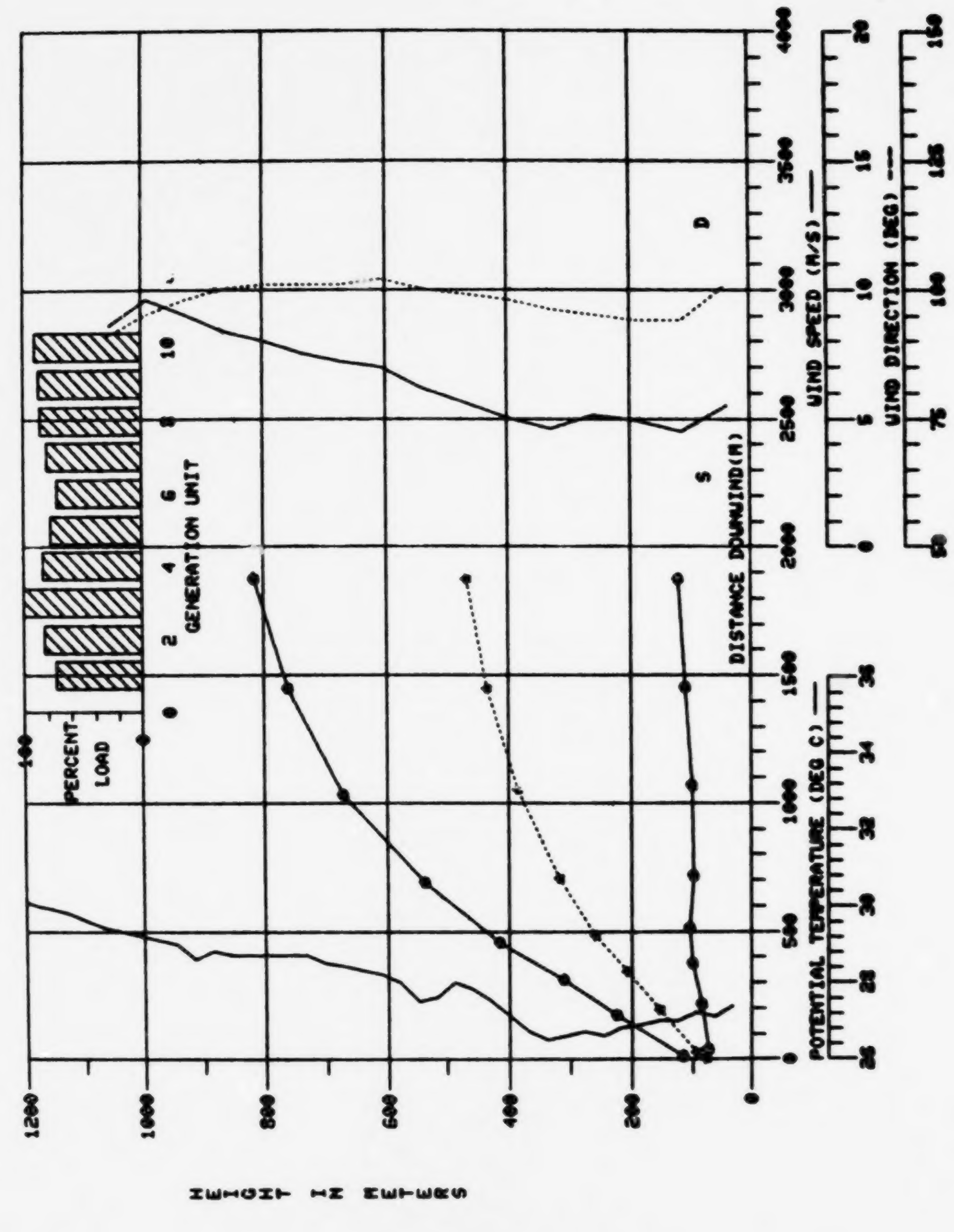
WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.5	1.1

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	435
VO (M/S)	14.0
FM (M4/S2)	583
FB (M4/S3)	184
LM (M)	4.1
LB (M)	0.9
NO.STACKS	10

PLUME RISE DATA
SHAWNEE STEAM PLANT
7/26/73-1100 HOURS



OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 7/26/73-1220 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 1205 - 1239 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
150	-10	92	105	121	47	62
353	3	305	188	329	95	95
632	13	587	315	609	164	152
1021	21	975	439	998	230	210
1344	16	1332	484	1338	250	233
1681	35	1683	497	1682	266	231
1965	28	1980	477	1972	252	224

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 3 BETA= 11 DIR= 95

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 1205 - POTENTIAL TEMP (C)	AIRCRAFT GRAD (DC/100M)	PIBALS 1145&1200 SPEED (M/S)	PIBALS DIR (WIND TO) (DEG)
50	27.3	0.8	4.2	107
100	27.6	1.7	5.1	104
150	28.2	0.0	5.7	104
200	28.2	0.1	6.2	104
250	28.3	0.3	6.5	104
300	28.3	-0.5	6.9	105
350	28.1	-0.3	7.0	104
400	28.1	0.3	6.9	103
450	28.3	0.1	6.8	101
500	28.2	-0.0	6.8	98
550	28.3	-0.4	6.9	96
600	28.1	0.3	7.0	94
650	28.3	0.2	6.9	91
700	28.3	0.2	6.9	89
750			7.2	88
800			7.5	89
850			7.6	91
TOWER	29.2	-0.6	3.1	113

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	103	436
2	138	436
3	153	451
4	110	443
5	116	439
6	108	435
7	118	439
8	129	444
9	130	440
10	138	441

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X=1972(M)
Z= 252(M)
R= 224(M)
SLOPE=0.0

AVERAGED METEOROLOGICAL CONDITIONS

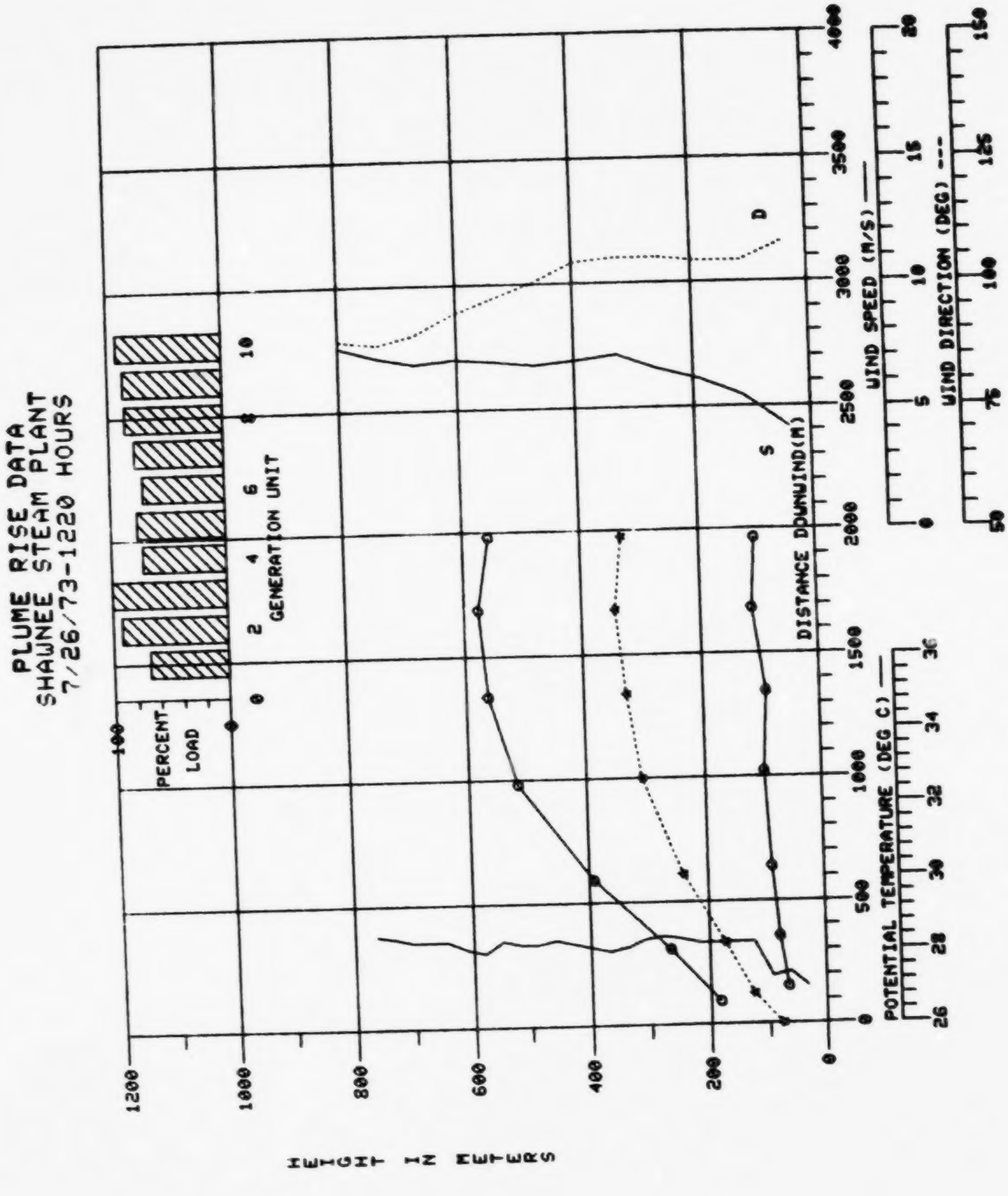
UNIT	1-4
UBAR (M/S)	6.5
DIR (DEG)	103
DT/DZ(C/100M)	0.19
UA0 (M/S)	5.2
TA0 (K)	300

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.3	-2.0

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	435
VO (M/S)	14.0
FM (M4/S2)	587
FB (M4/S3)	184
LM (M)	3.8
LB (M)	0.7
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
7/26/73-1220 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
POTENTIAL TEMPERATURE (DEG C)
WIND SPEED (M/S)
WIND DIRECTION (DEG)
S
D

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 7/27/73- 755 HOURS

PHOTOGRAPHIC DETERMINATIONS OF
RELATIVE RISE - TOP & BOTTOM
VS X FOR 741 - 815 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
114	4	11	165	62	84	63
237	95	164	320	200	207	118
480	160	419	460	449	310	154
804	168	784	538	794	353	185
1203	165	1206	560	1204	362	197
1788	186	1813	581	1800	383	197
2839	210	2871	560	2855	385	175
3763	191	3799	526	3781	358	167
4815	172	4854	487	4839	329	158

NOTE: THE X-Z ORIGIN IS BETWEEN
STACKS 4 AND 5
CS#= 5 BETA=-35 DIR=110

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 806 - POTENTIAL TEMP (C)	AIRCRAFT - 806 - GRAD (DC/100M)	PIBALS 845& 900 SPEED (M/S)	PIBALS 845& 900 DIR (WIND TO) (DEG)
50	24.5	0.2	1.9	128
100	24.8	0.8	2.2	131
150	25.6	2.0	2.5	127
200	26.6	2.0	3.0	119
250	27.1	0.7	3.7	109
300	27.5	0.5	4.0	99
350	27.6	0.1	4.1	93
400	27.7	0.3	3.9	91
450	28.0	0.7	4.1	90
500	28.2	0.4	4.3	90
550	28.5	0.3	4.5	91
600	28.6	0.3	4.4	91
650	28.6	0.1	4.7	93
700	28.7	0.2	5.0	95
750	28.9	0.3	5.5	97
800	29.0	0.1	6.1	96
850	29.2	0.5	7.3	95
TOWER	24.4	-0.2	1.6	113

GENERATION AND
PREHEATER EXIT
TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	122	440
2	150	436
3	146	447
4	150	441
5	150	441
6	150	443
7	144	437
8	128	438
9	152	438
10	145	440

* * * SUMMARY VARIABLES * * *

OBSERVED
FINAL RISE
X=4839(M)
Z= 329(M)
R= 158(M)
SLOPE=0.0

AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	3.6
DIR (DEG)	105
DT/DZ(C/100M)	0.80
UAG (M/S)	2.2
TAG (K)	297

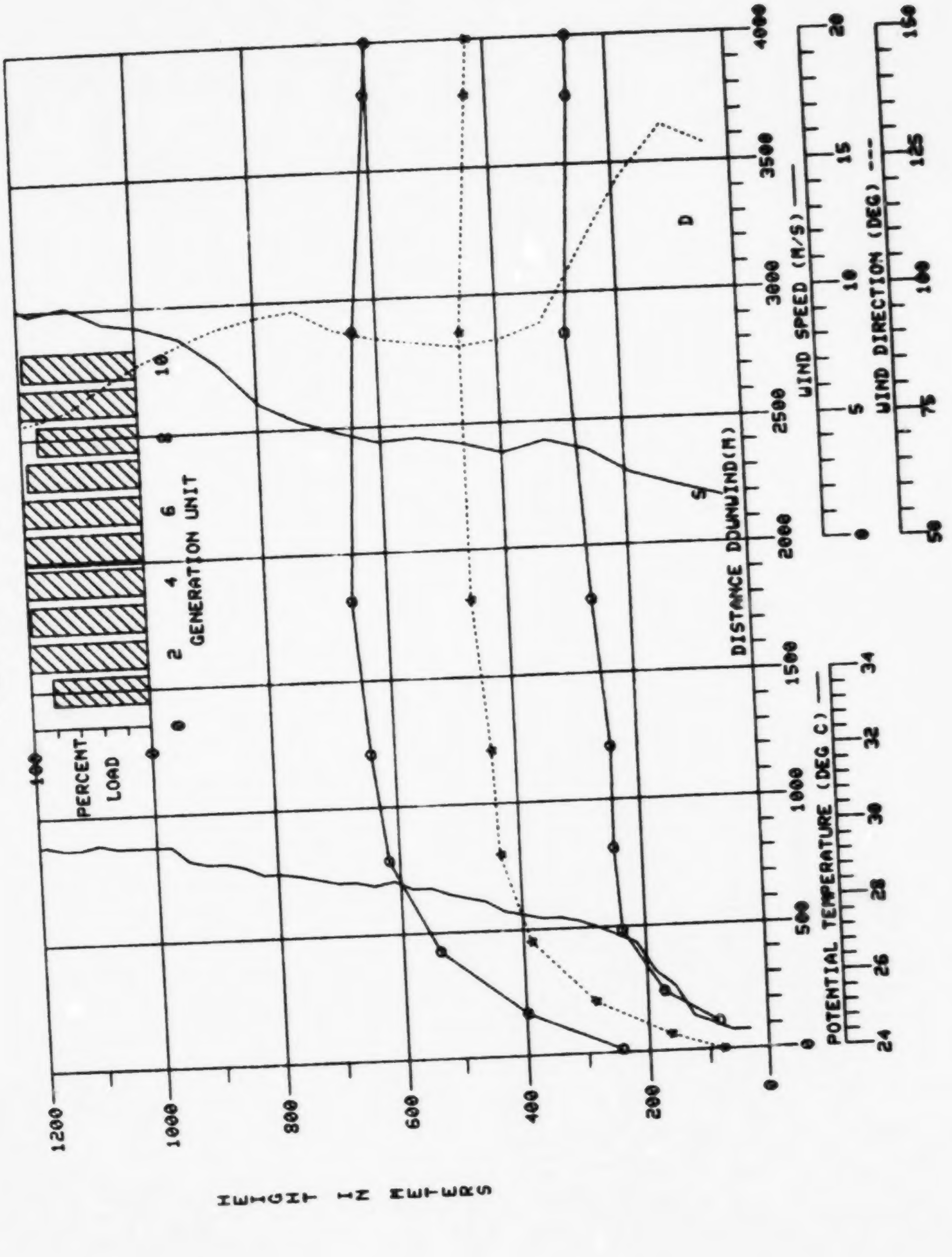
WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.4	-8.4

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	434
VO (M/S)	15.9
FM (M4/S2)	749
FB (M4/S3)	212
LM (M)	7.6
LB (M)	4.5
NO.STACKS	10

PLUME RISE DATA
SHAWNEE STEAM PLANT
7/27/73- 755 HOURS



OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 7/27/73- 855 HOURS

PHOTOGRAPHIC DETERMINATIONS OF
RELATIVE RISE - TOP & BOTTOM
VS X FOR 840 - 914 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
112	2	25	145	68	73	72
237	142	140	307	188	224	100
514	221	465	527	469	374	155
896	232	871	611	883	421	189
1323	265	1319	652	1321	458	193
1936	277	1947	677	1941	477	200
2727	255	2746	674	2736	464	209
3479	254	3518	657	3498	455	201
4314	269	4366	658	4340	463	194
5382	283	5427	661	5404	472	183

NOTE: THE X-Z ORIGIN IS BETWEEN
STACKS 4 AND 5
CS#= 5 BETA=-40 DIR=110

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 908 - POTENTIAL TEMP (C)	GRAD (DC/100M)	PIBALS 945&1000 SPEED (WIND TO) (M/S)	DIR (DEG)
50	26.0	-0.1	1.6	92
100	26.1	0.1	1.6	93
150	26.1	0.0	1.6	94
200	26.2	0.3	1.6	96
250	26.3	0.1	1.8	97
300	26.6	1.3	2.2	100
350	27.2	0.7	2.7	103
400	27.3	0.2	3.2	105
450	27.4	0.0	3.5	107
500	27.4	0.3	3.6	107
550	27.8	0.6	3.7	107
600	28.0	0.2	3.9	106
650	28.0	-0.1	4.6	105
700	28.3	0.8	5.2	105
750	28.4	0.2	5.7	106
800	28.7	0.7	6.4	106
850	29.0	0.7	7.4	104
900	29.3	0.7	8.2	102
950	29.7	0.6	8.6	99
1000	30.0	0.7	8.9	96
TOWER	25.5	-0.2	0.9	68

GENERATION AND
PREHEATER EXIT
TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	100	442
2	138	438
3	136	446
4	135	440
5	122	437
6	128	444
7	150	438
8	128	440
9	155	440
10	148	438

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X=5404(M)
Z= 472(M)
R= 188(M)
SLOPE=0.01

AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	3.1
DIR (DEG)	103
DT/DZ(C/100M)	0.36
UAG (M/S)	1.6
TAO (K)	299

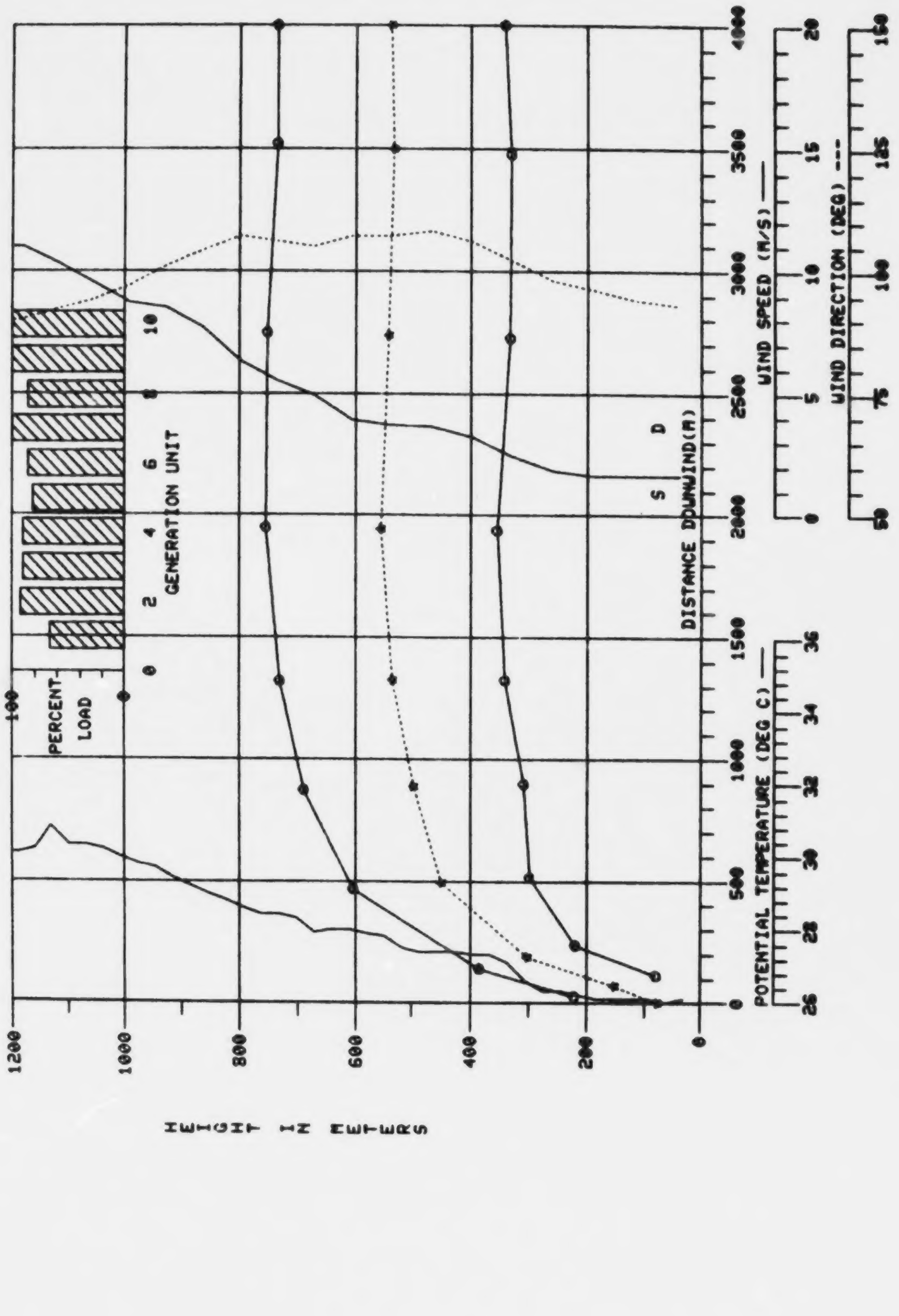
WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.7	1.8

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	434
VO (M/S)	15.0
FM (M4/S2)	671
FB (M4/S3)	197
LM (M)	8.4
LB (M)	6.8
NO.STACKS	10

PLUME RISE DATA
SHAWNEE STEAM PLANT
7/27/73- 855 HOURS



OBSERVED PLUME RISE AND ATMOSPHERIC DATA

SHAWNEE STEAM PLANT 7/27/73- 955 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 940 - 1014 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
110	10	44	125	77	67	59
213	148	82	294	147	221	102
524	294	376	564	450	429	155
1050	375	1021	763	1035	571	196
1830	419	1841	869	1835	644	224
2831	422	2862	964	2846	693	269
4147	421	4195	1030	4171	725	303
6125	510	6207	1070	6166	790	278

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5

CS#= 5 BETA=-45 DIR=110

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 1009 - POTENTIAL TEMP (C)	AIRCRAFT GRAD (DC/100M)	PIBALS 1045&1100 SPEED (M/S)	PIBALS DIR (WIND TO) (DEG)
50	27.3	-0.3	1.6	80
100	27.2	0.1	1.6	80
150	27.3	-0.1	1.7	80
200	27.3	0.2	1.9	81
250	27.2	0.2	2.2	81
300	27.7	0.7	2.4	82
350	27.6	-0.7	2.7	83
400	27.4	0.4	3.0	85
450	27.7	0.1	3.1	87
500	27.7	0.3	3.3	88
550	27.8	0.2	3.6	89
600	27.9	0.2	4.0	91
650	28.1	0.5	4.4	96
700	28.5	1.0	4.8	98
750	29.0	1.0	5.2	100
800	29.5	0.8	5.4	100
850	29.9	0.8	5.7	100
900	30.1	0.1	6.1	98
950	30.1	0.0	6.6	95
1000	30.1	0.0	7.1	93
1050	30.1	0.0	7.6	93
1100	30.1	-0.2		
1150	30.0	-0.0		
1200	30.0	-0.2		
1250	30.0	0.2		
1300	30.1	0.2		
TOWER	27.0	-0.6	0.9	113

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	100	443
2	129	438
3	132	446
4	136	439
5	116	437
6	122	444
7	142	440
8	112	437
9	155	440
10	148	439

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X=6166(M)

Z= 790(M)

R= 278(M)

SLOPE=0.03

AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	4.0
DIR (DEG)	91
DT/DZ(C/100M)	0.26
UAO (M/S)	1.6
TAO (K)	300

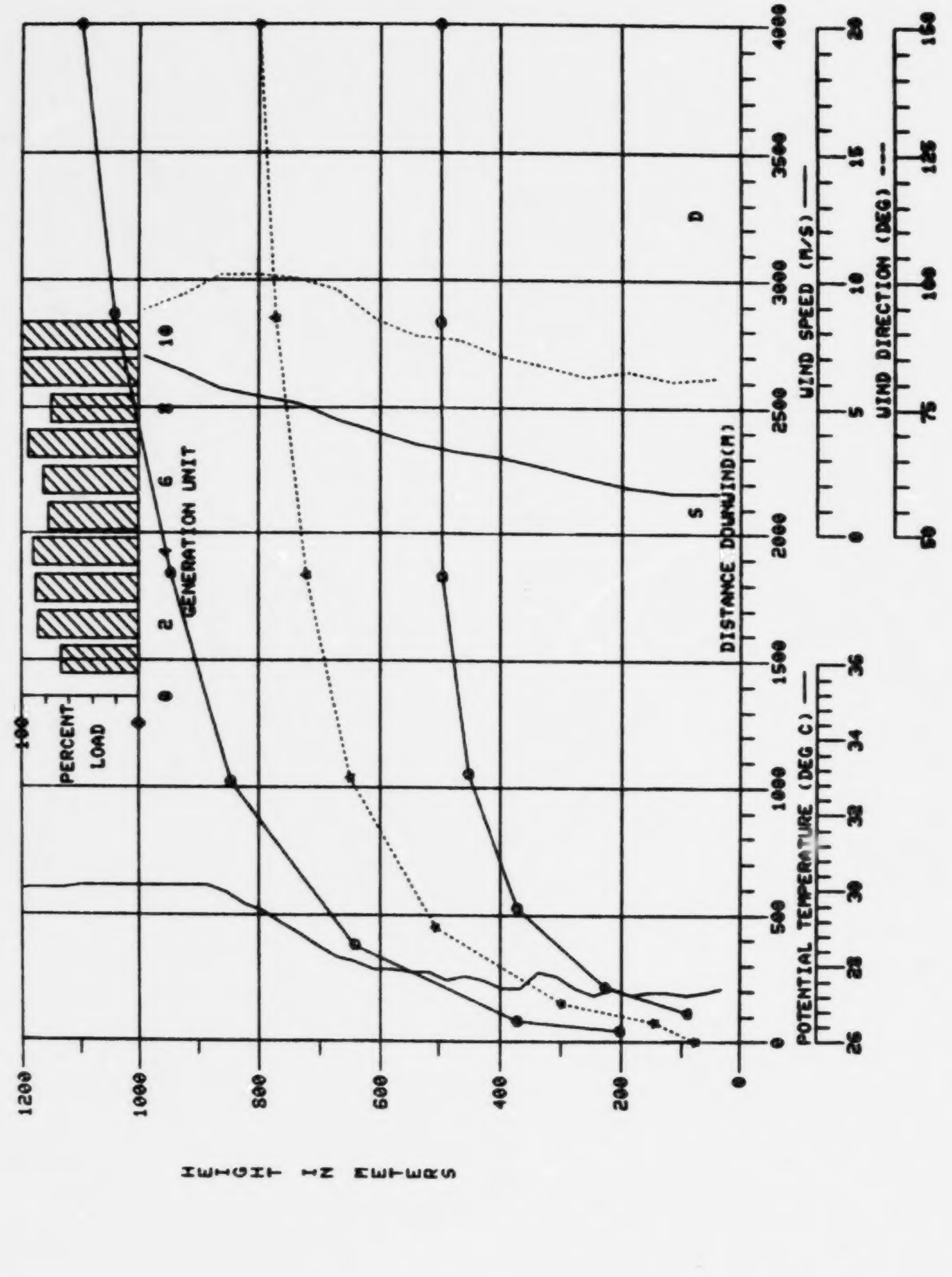
WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.6	2.1

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	434
VO (M/S)	14.5
FM (M4/S2)	632
FB (M4/S3)	190
LM (M)	6.2
LB (M)	2.9
NO.STACKS	10

PLUME RISE DATA
SHAWNEE STEAM PLANT
7/27/73- 955 HOURS



OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 7/27/73-1055 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 1040 - 1114 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
125	8	11	145	68	76	85
375	130	210	374	292	252	148
731	197	535	658	633	427	251
1179	211	1139	864	1159	537	324
1850	251	1842	901	1846	576	324
2679	301	2708	983	2693	642	339
3967	365	4056	1087	4011	726	357
6771	460	6922	1204	6846	832	368

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 5 BETA=-50 DIR=110

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 1110 - POTENTIAL TEMP (C)	AIRCRAFT - 1110 - GRAD (DC/100M)	PIBALS 1045&1100 SPEED (M/S)	PIBALS 1045&1100 DIR (WIND TO) (DEG)
50	27.5	1.0	1.6	80
100	27.6	-0.1	1.6	80
150	27.6	0.0	1.7	80
200	27.6	-0.1	1.9	81
250	27.5	-0.1	2.2	81
300	27.4	-0.2	2.4	82
350	27.3	-0.3	2.7	83
400	27.3	0.1	3.0	85
450	27.3	0.1	3.1	87
500	27.4	0.0	3.3	88
550	27.3	0.0	3.6	89
600	27.6	0.4	4.0	91
650	27.5	-0.1	4.4	96
700	27.8	1.0	4.8	98
750	28.2	0.5	5.2	100
800	28.6	1.0	5.4	100
850	29.2	0.7	5.7	100
900	29.4	0.7	6.1	98
950	29.7	0.3	6.6	95
1000	29.7	0.3	7.1	93
1050	30.0	0.4	7.6	93
1100	30.1	0.3		
1150	30.3	0.2		
1200	30.4	0.3		
1250	30.6	0.5		
1300	30.8	0.3		
TOWER	26.7	-1.1	1.3	90

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	100	444
2	130	439
3	133	446
4	133	439
5	123	439
6	130	443
7	137	441
8	104	438
9	155	440
10	146	440

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X=6846(M)
Z= 832(M)
R= 368(M)
SLOPE=0.04

AVERAGED METEOROLOGICAL CONDITIONS

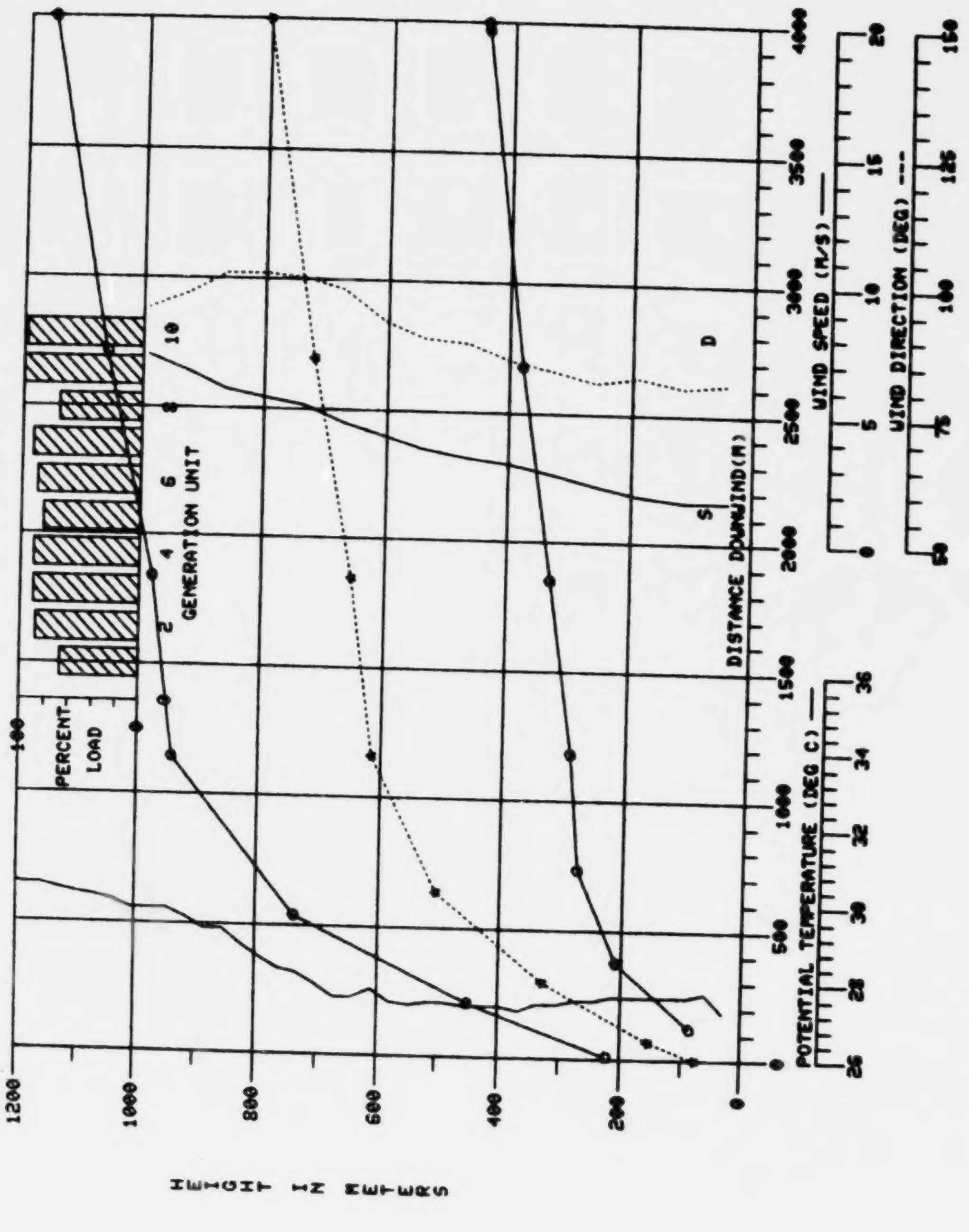
UNIT	1-4
UAV (M/S)	4.0
DIR (DEG)	91
DT/DZ(C/100M)	0.26
UAO (M/S)	1.6
TAO (K)	300

WIND SHEAR SPEED (M/S/100M)	WIND SHEAR DIRECTION (DEG/100M)
0.6	2.1

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	435
VO (M/S)	14.5
FM (M4/S2)	631
FH (M4/S3)	191
LM (M)	6.2
LH (M)	2.9
NO.STACKS	10

PLUME RISE DATA
SHAWNEE STEAM PLANT
7/27/73-1055 HOURS



OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT   8/ 1/73- 855 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 841 - 915 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
74	-3	32	90	53	43	48
221	22	166	182	193	102	85
389	15	335	281	362	148	135
LR	LR	580	358	----	---	---
LR	LR	897	446	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 7 BETA=-10 DIR=180

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 901 - POTENTIAL TEMP (C)	AIRCRAFT - 901 - POTENTIAL GRAD (DC/100M)	PIBALS 845& 900 SPEED (WIND (M/S)	PIBALS 845& 900 DIR TO) (DEG)
50	21.5	0.3	3.6	145
100	21.6	-0.1	3.6	156
150	21.6	0.0	3.6	157
200	21.6	0.2	3.8	157
250	21.6	0.0	4.6	153
300	21.8	0.3	4.9	152
350	21.8	0.2	5.4	154
400	21.9	-0.0	6.6	158
450	22.0	0.5	7.8	162
500	22.1	0.3	8.5	148
550			8.8	129
600			8.5	124
650			8.4	126
700			8.0	130
750				
800				
850				
TOWER	23.6	-0.6	2.2	203

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	117	445
2	134	441
3	125	441
4	120	440
5	95	429
6	119	435
7	122	439
8	127	439
9	127	439
10	117	436

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X= 362(M)
Z= 148(M)
R= 135(M)
SLOPE=0.27

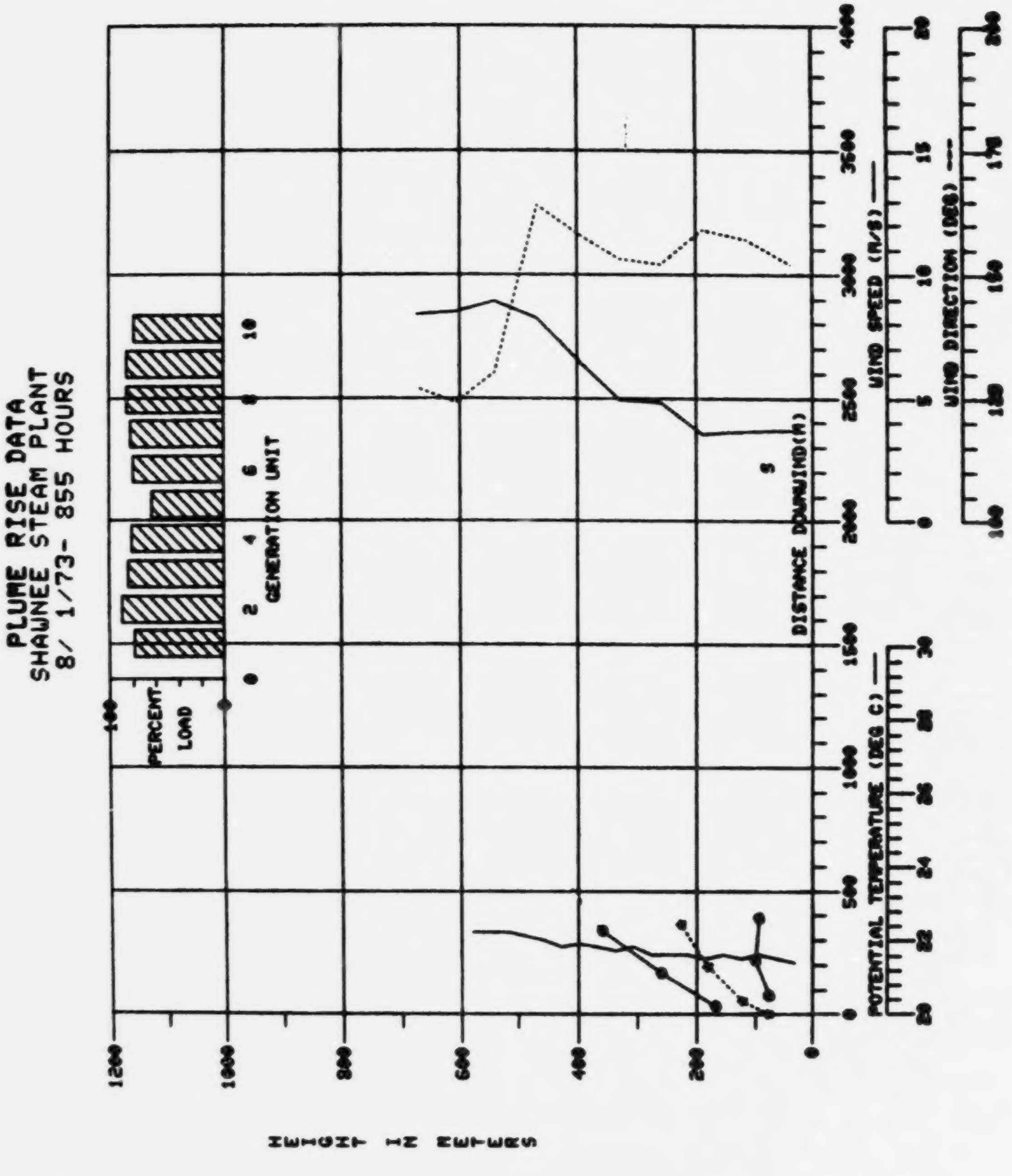
AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	4.2
DIR (DEG)	155
DT/DZ(C/100M)	0.08
UA0 (M/S)	3.6
TA0 (K)	294

WIND SHEAR SPEED (M/S/100M)	WIND SHEAR DIRECTION (DEG/100M)
1.0	-0.6

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	433
VO (M/S)	13.4
FM (M4/S2)	530
FB (M4/S3)	182
LM (M)	5.5
LB (M)	2.4
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
8/ 1/73- 855 HOURS
100
PERCENT
LOAD
0
0
2
4
6
8
10
GENERATION UNIT
S
DISTANCE DOWNWIND(M)
0
500
1000
1500
2000
2500
3000
3500
4000
POTENTIAL TEMPERATURE (DEG C)
20
22
24
26
28
30
WIND SPEED (M/S)
0
5
10
15
20
WIND DIRECTION (DEG)
100
200
HEIGHT IN METERS
0
200
400
600
800
1000
1200

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 8/ 1/73-1055 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 1040 - 1115 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
73	-2	54	58	63	28	30
236	11	222	94	229	52	42
468	17	446	166	457	91	75
673	26	641	240	657	133	108
845	33	838	300	841	166	132

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 7 BETA=-20 DIR=170

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 1101 - POTENTIAL TEMP (C)	AIRCRAFT - 1101 - POTENTIAL GRAD (DC/100M)	PIBALS 1045&1100 SPEED (WIND TO) (M/S)	PIBALS 1045&1100 DIR (WIND TO) (DEG)
50	23.5	-0.1	5.4	170
100	23.6	-0.1	6.2	162
150	23.6	0.2	6.6	162
200	23.7	0.2	6.9	161
250	23.5	-0.2	7.0	164
300	23.6	-0.1	7.1	166
350	23.5	-0.1	7.1	166
400	23.5	0.0	7.0	166
450	23.6	0.2	7.0	166
500	23.6	0.2	7.0	166
550	23.6	0.0	7.1	167
600	23.7	-0.1	7.2	168
650	23.6	-0.1	7.5	172
700	23.7	0.5	7.8	172
750	24.0	0.4	7.8	168
800	24.0	0.1	7.3	165
850	24.2	0.0	6.7	164
TOWER	25.0	-0.2	2.7	158

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	119	445
2	134	440
3	124	440
4	123	439
5	96	429
6	117	440
7	122	432
8	128	439
9	120	433
10	116	436

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X= 841(M)
Z= 166(M)
R= 132(M)
SLOPE=0.18

AVERAGED METEOROLOGICAL CONDITIONS

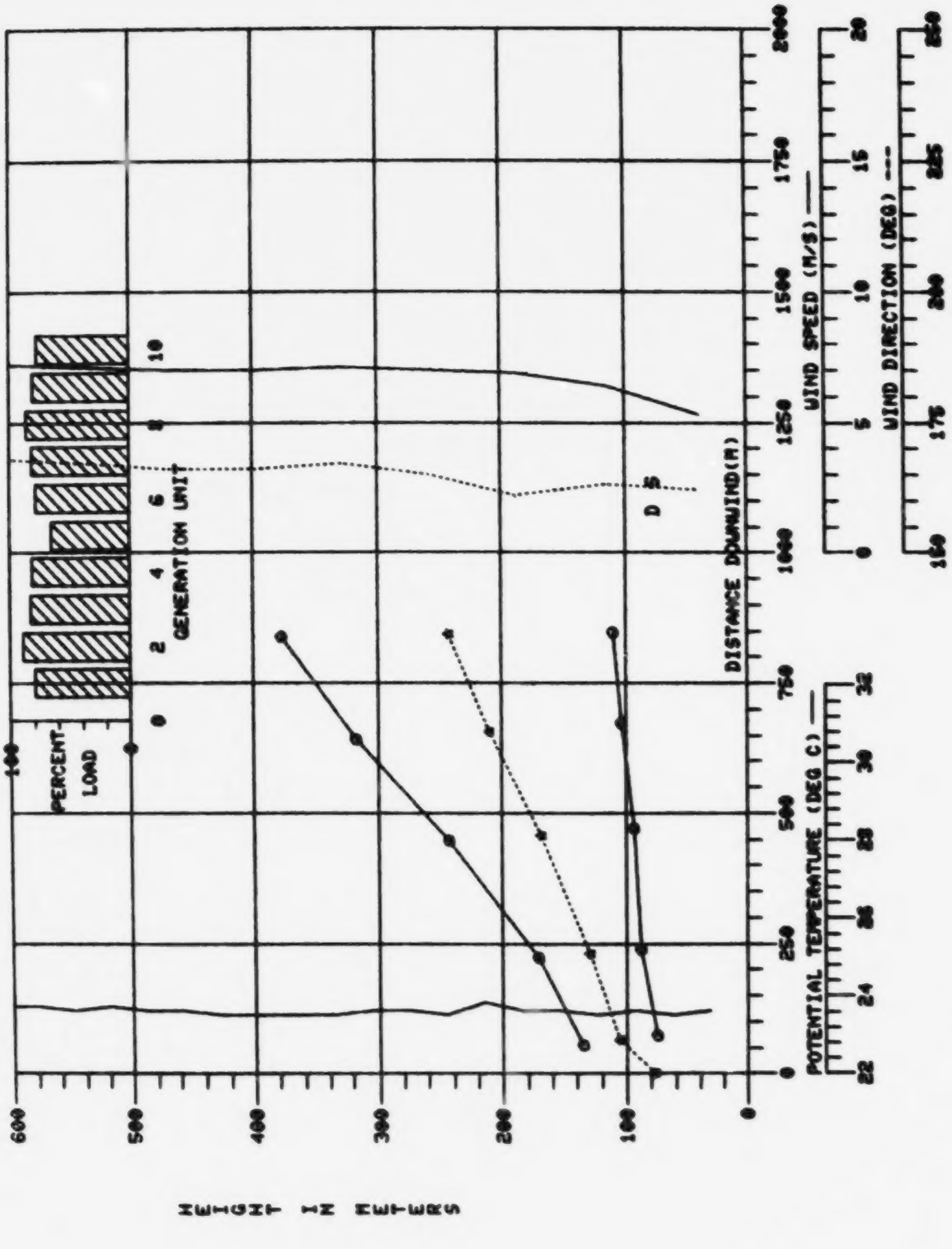
UNIT	1-4
UBAR (M/S)	6.8
DIR (DEG)	164
DT/DZ(C/100M)	-0.01
UA0 (M/S)	6.2
TA0 (K)	296

WIND SHEAR SPEED (M/S/100M)	WIND SHEAR DIRECTION (DEG/100M)
0.2	1.7

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	432
VO (M/S)	13.4
FM (M4/S2)	528
FB (M4/S3)	178
LM (M)	3.4
LB (M)	0.6
NO.STACKS	10

PLUME RISE DATA
SHAWNEE STEAM PLANT
8/ 1/73-1055 HOURS



OBSERVED PLUME RISE AND ATMOSPHERIC DATA

SHAWNEE STEAM PLANT   8/ 1/73-1155 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 1140 - 1214 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
80	-6	54	63	67	28	36
238	-9	219	131	228	61	70
464	-5	433	230	448	112	117
LR	LR	889	364	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5

CS#= 7 BETA=-25 DIR=165

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 1201 - POTENTIAL TEMP (C)	AIRCRAFT - 1201 - GRAD (DC/100M)	PIBALS 1145&1200 SPEED (M/S)	PIBALS 1145&1200 DIR (WIND TO) (DEG)
50	24.4	-0.9	6.7	130
100	24.1	-0.4	7.1	128
150	23.9	-0.0	8.1	128
200	24.0	0.2	8.9	127
250	24.2	0.4	8.6	127
300	24.1	-0.6	8.6	128
350	23.9	-0.4	8.3	128
400	23.8	0.2	7.6	130
450	23.9	0.1	7.2	129
500	24.0	0.1	7.1	129
550	24.0	-0.2	7.1	129
600	24.0	0.3	6.7	132
650	24.0	0.1	7.1	130
700	24.2	0.3	7.3	130
750	24.3	-0.0	7.3	131
800	24.3	0.3	7.5	129
850	24.4	0.3	7.4	128
TOWER	24.2	-0.6	4.0	158

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	120	443
2	135	439
3	124	439
4	121	441
5	98	430
6	115	439
7	121	432
8	131	439
9	120	435
10	116	443

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X= 448(M)
Z= 112(M)
R= 117(M)
SLOPE=0.23

AVERAGED METEOROLOGICAL CONDITIONS

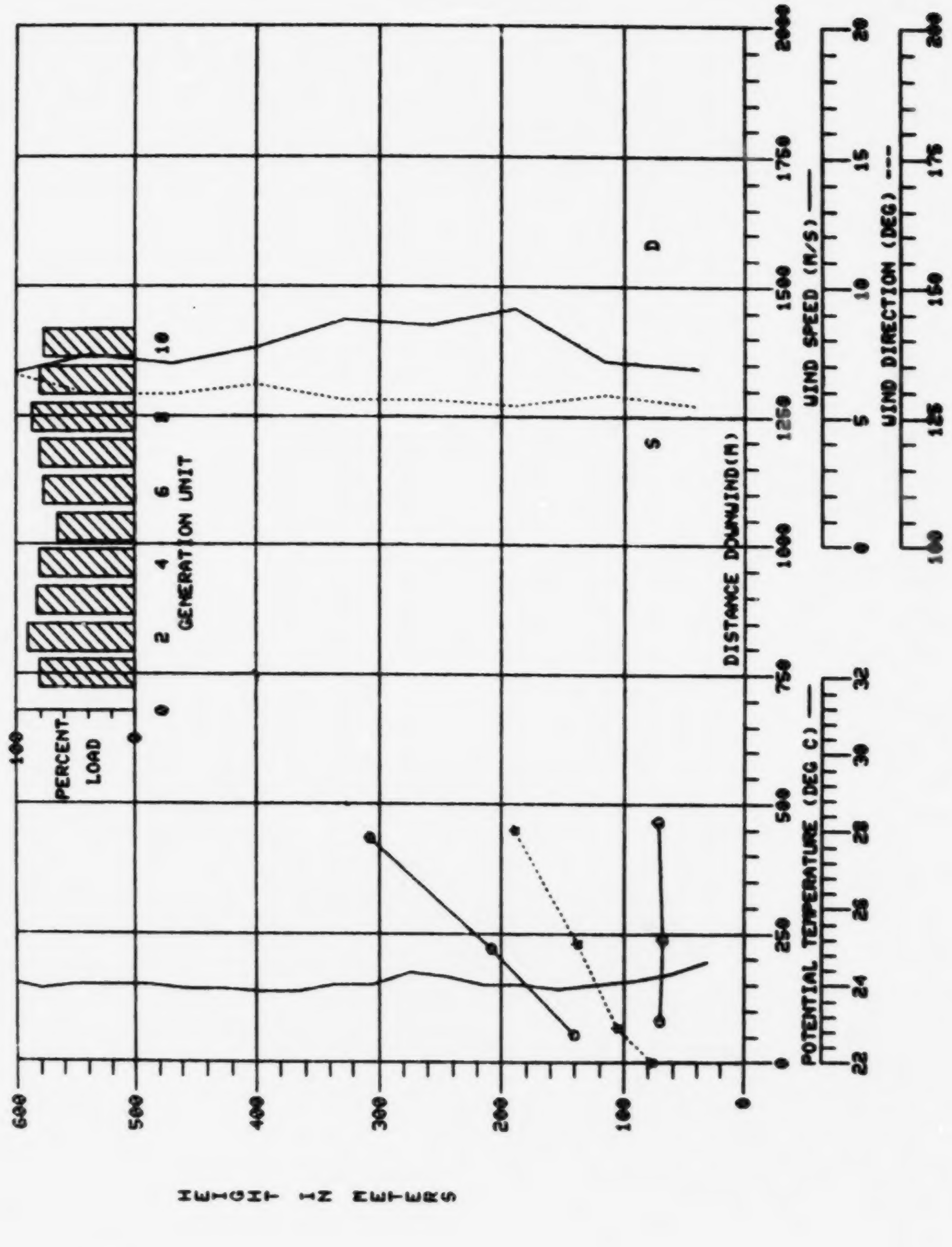
UNIT	1-4
UBAR (M/S)	8.2
DIR (DEG)	128
DT/DZ(C/100M)	-0.09
UA0 (M/S)	7.1
TA0 (K)	297

WIND SHEAR SPEED (M/S/100M)	WIND SHEAR DIRECTION (DEG/100M)
0.6	-0.3

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	432
VO (M/S)	13.4
FM (M4/S2)	533
FB (M4/S3)	177
LM (M)	2.8
LB (M)	0.3
NO.STACKS	10

PLUME RISE DATA
SHAWNEE STEAM PLANT
8/ 1/73-1155 HOURS



OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 8/ 2/73- 745 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 731 - 805 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
94	-4	49	94	71	45	53
259	-8	238	158	248	75	83
398	-11	400	199	399	94	104
LR	LR	744	246	----	---	---
LR	LR	1119	269	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 7 BETA= 4 DIR=195

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 758 - POTENTIAL TEMP (C)	AIRCRAFT GRAD (DC/100M)	PIBALS 745& 800 SPEED (WIND TO) (M/S)	PIBALS DIR (DEG)
50	18.7	0.3	3.3	186
100	18.9	0.7	4.4	184
150	18.9	0.4	5.5	186
200	19.6	1.2	6.4	188
250	20.2	0.8	7.0	188
300	20.6	1.0	7.0	188
350	21.0	0.5	7.0	187
400	21.2	0.8	7.1	186
450	21.6	0.4	6.8	186
500	21.8	0.5	6.8	185
550	22.0	-0.0	6.9	183
600	22.0	0.2	6.5	182
650	22.0	0.2	6.1	179
700	22.1	0.3	5.5	177
750	22.4	0.3	4.9	176
800	22.4	0.0	4.5	178
850	22.5	0.2	4.4	182
TOWER	17.0	-0.6	1.8	203

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	118	446
2	89	441
3	94	451
4	111	438
5	65	0
6	62	432
7	102	435
8	---	---
9	---	---
10	---	---

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X= 399(M)
Z= 94(M)
R= 104(M)
SLOPE=0.13

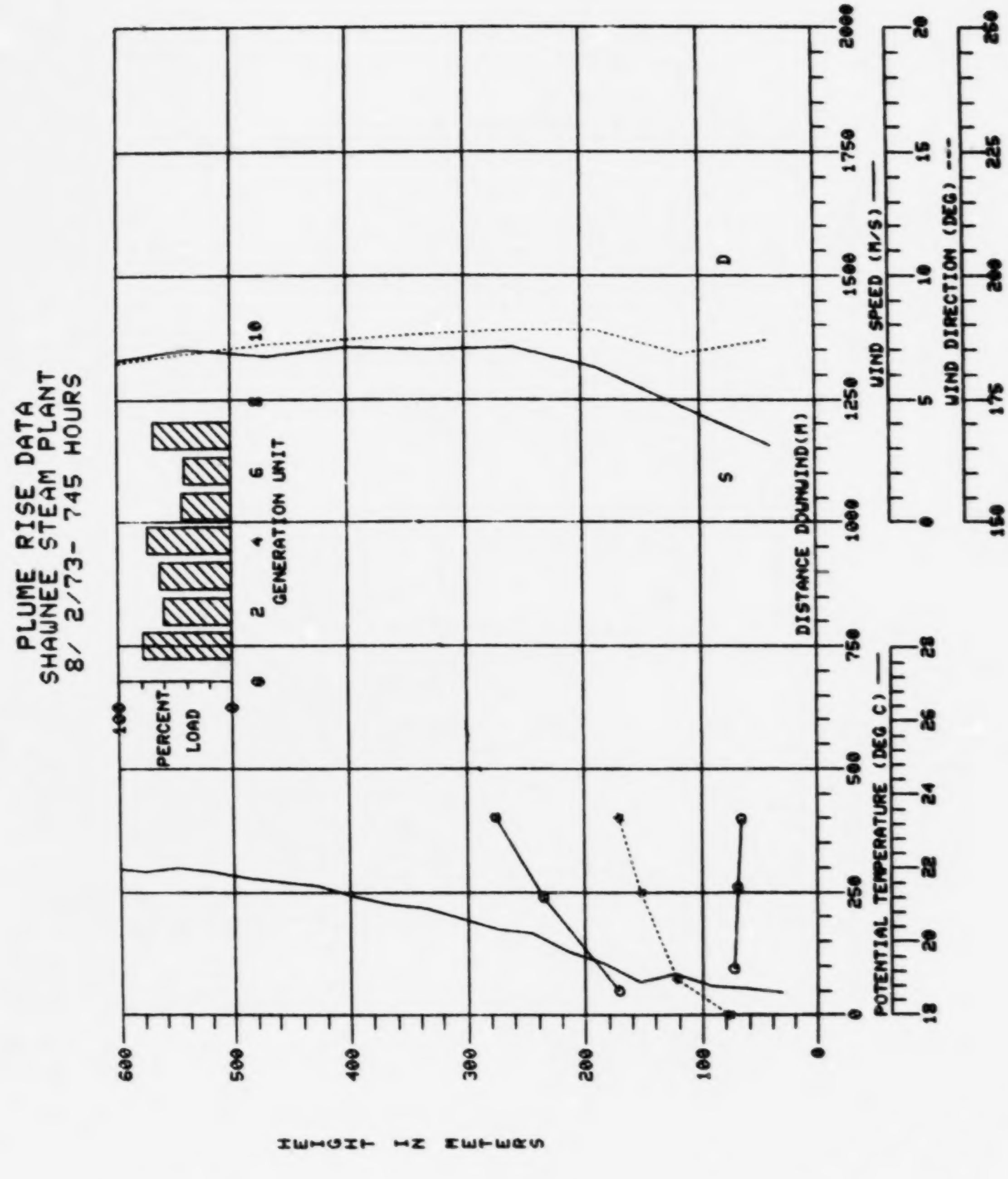
AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	5.8
DIR (DEG)	187
DT/DZ(C/100M)	0.78
UA0 (M/S)	4.5
TA0 (K)	291

WIND SHEAR SPEED (M/S/100M)	WIND SHEAR DIRECTION (DEG/100M)
1.1	1.7

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	435
VO (M/S)	11.2
FM (M4/S2)	366
FB (M4/S3)	157
LM (M)	3.3
LB (M)	0.8
NO.STACKS	6


PLUME RISE DATA
SHAWNEE STEAM PLANT
8/ 2/73- 745 HOURS
HEIGHT IN METERS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
POTENTIAL TEMPERATURE (DEG C) —
WIND SPEED (M/S) —
WIND DIRECTION (DEG) ---
S
D

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 8/ 2/73- 855 HOURS

PHOTOGRAPHIC DETERMINATIONS OF
RELATIVE RISE - TOP & BOTTOM
VS X FOR 841 - 915 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
80	-6	50	89	65	41	47
245	6	225	173	235	89	63
450	13	430	279	440	146	131
LR	LR	737	391	----	---	---
LR	LR	1092	436	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN
STACKS 4 AND 5
CS#= 7 BETA= 0 DIR=190

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 859 - POTENTIAL TEMP (C)	AIRCRAFT - 859 - GRAD (DC/100M)	PIBALS 845& 900 SPEED (WIND TO) (M/S)	PIBALS 845& 900 DIR (WIND TO) (DEG)
50	19.6	-0.2	3.4	175
100	19.6	0.0	4.0	179
150	19.8	0.4	4.3	182
200	19.9	0.2	4.6	182
250	19.9	-0.4	4.8	184
300	20.3	1.6	5.2	186
350	20.7	0.5	5.9	186
400	21.0	0.8	6.8	183
450	21.3	0.5	7.2	180
500	21.5	0.2	7.0	179
550	21.5	0.5	6.6	179
600	21.7	-0.0	6.3	180
650	21.9	0.5	6.1	179
700	22.0	0.0	6.0	178
750	22.1	0.3	5.9	176
800	22.2	0.3	5.7	175
850	22.5	0.4	5.5	175
TOWER	20.8	-1.7	1.8	203

GENERATION AND
PREHEATER EXIT
TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	145	446
2	138	442
3	127	448
4	137	439
5	79	426
6	80	438
7	130	435
8	---	---
9	---	---
10	---	---

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X= 440(M)
Z= 146(M)
R= 131(M)
SLOPE=0.28

AVERAGED METEOROLOGICAL CONDITIONS

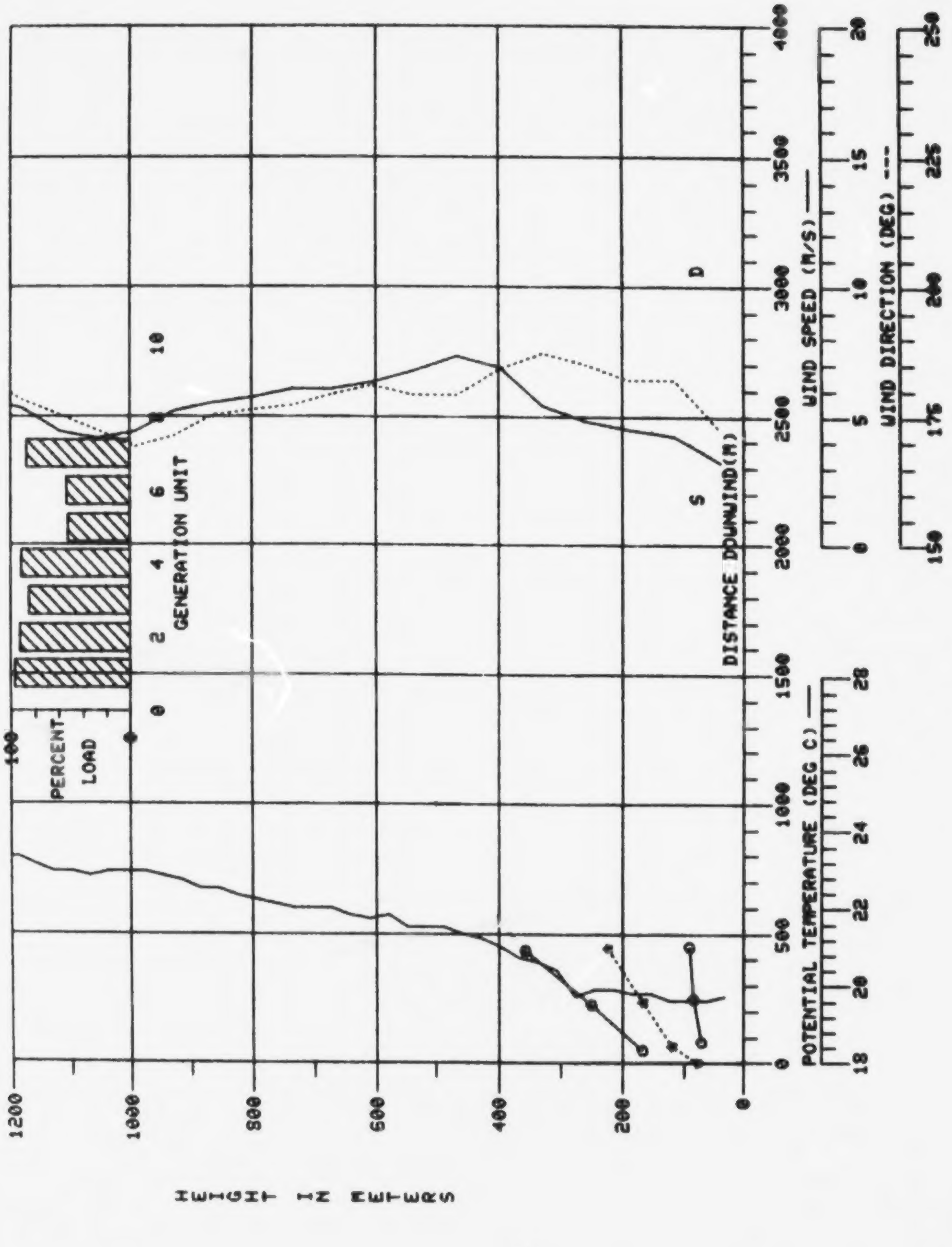
UNIT	1-4
UBAR (M/S)	4.7
DIR (DEG)	183
DT/DZ(C/100M)	0.38
UA0 (M/S)	4.0
TA0 (K)	292

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.9	1.3

AVERAGE EXIT CONDITIONS

UNIT	1-4
T0 (K)	434
V0 (M/S)	13.9
FM (M4/S2)	563
FB (M4/S3)	193
LM (M)	5.1
LB (M)	1.9
NO.STACKS	7


PLUME RISE DATA
SHAWNEE STEAM PLANT
8/ 2/73- 855 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
POTENTIAL TEMPERATURE (DEG C)
WIND SPEED (M/S)
WIND DIRECTION (DEG)
S
D

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT   8/ 2/73- 955 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 940 - 1014 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
86	3	54	79	70	41	40
179	9	160	118	169	63	55
290	-8	284	175	287	83	91
LR	LR	597	320	----	---	---
LR	LR	1167	531	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 7 BETA=-10 DIR=180

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 958 - POTENTIAL TEMP (C)	AIRCRAFT - 958 - GRAD (DC/100M)	PIBALS 945&1000 SPEED (M/S)	PIBALS 945&1000 DIR (WIND TO) (DEG)
50	21.2	-1.3	3.9	192
100	20.8	-0.0	4.4	189
150	20.9	0.2	4.7	186
200	21.2	0.7	4.9	182
250	21.2	-0.4	4.8	177
300	21.2	0.3	4.9	176
350	21.4	0.3	5.3	176
400	21.3	-0.3	5.8	175
450	21.3	-0.2	6.0	174
500	21.1	-0.3	6.0	174
550	21.2	0.1	6.0	174
600	21.2	0.4	5.9	174
650	21.4	0.1	5.7	176
700	21.5	0.3	5.6	177
750	21.6	0.5	5.6	177
800	21.9	0.7	5.8	177
850	22.2	0.5	5.9	177
TOWER	22.2	-3.3	2.2	203

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	144	444
2	153	441
3	141	450
4	150	446
5	97	426
6	99	435
7	145	436
8	---	---
9	---	---
10	---	---

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X= 287(M)
Z= 83(M)
R= 91(M)
SLOPE=0.17

AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	4.7
DIR (DEG)	185
DT/DZ(C/100M)	0.16
UA0 (M/S)	4.4
TA0 (K)	293

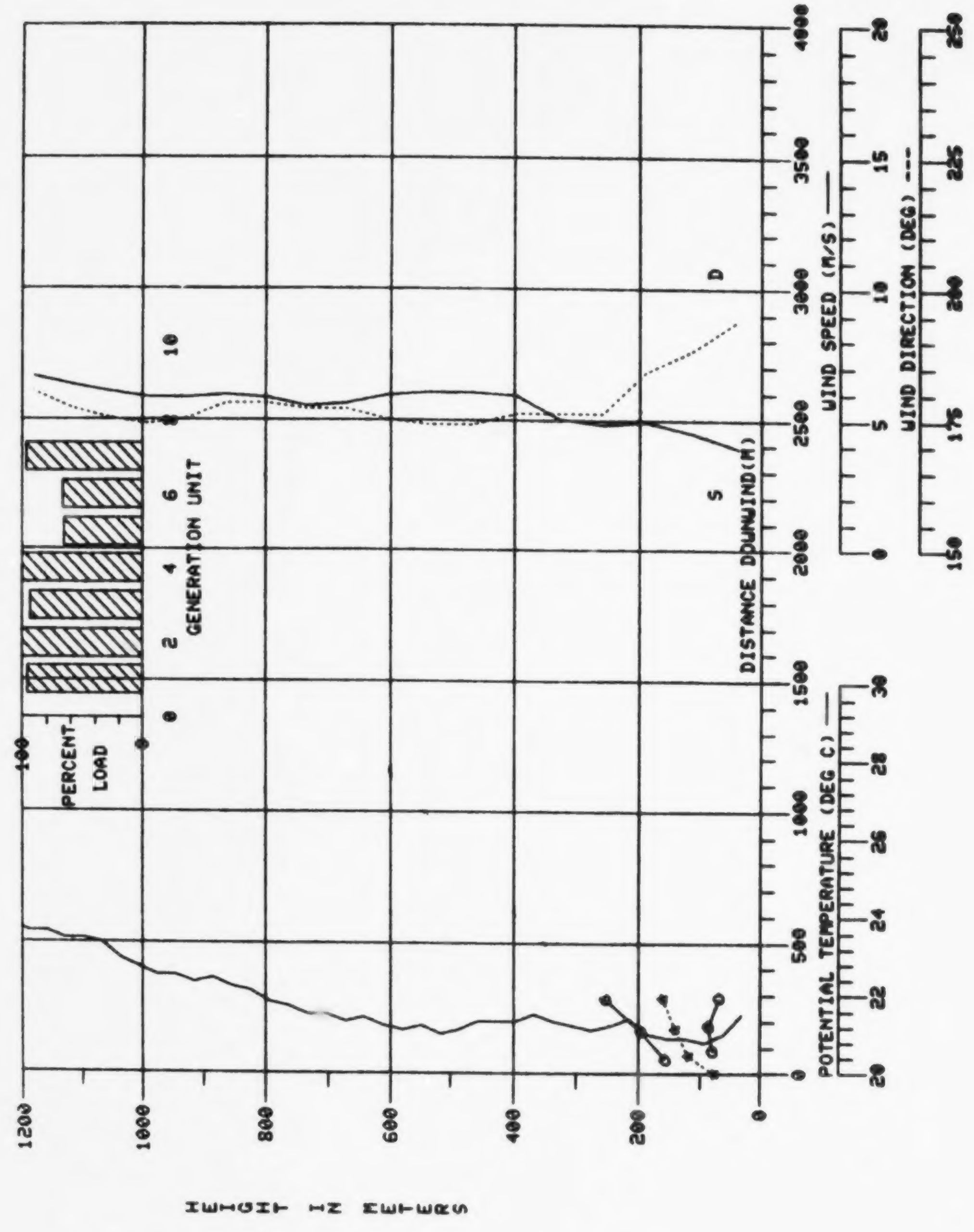
WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.2	-8.4

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	435
VO (M/S)	15.1
FM (M4/S2)	666
FB (M4/S3)	209
LM (M)	5.5
LB (M)	2.0
NO.STACKS	7

PLUME RISE DATA
SHAWNEE STEAM PLANT
8/ 2/73- 955 HOURS



OBSERVED PLUME RISE AND ATMOSPHERIC DATA

SHAWNEE STEAM PLANT 8/ 2/73-1055 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 1041 - 1115 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
87	-2	57	83	72	40	44
214	7	192	140	203	73	67
383	15	362	203	372	109	94
510	19	501	272	505	145	123
LR	LR	843	431	----	---	---
LR	LR	1300	561	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5

CS#= 7 BETA=-10 DIR=180

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 1057 - POTENTIAL TEMP (C)	AIRCRAFT GRAD (DC/100M)	PIBALS 1045&1100 SPEED (M/S)	PIBALS DIR (WIND TO) (DEG)
50	22.7	-1.0	4.2	195
100	22.3	-0.2	4.9	189
150	22.2	-0.8	5.0	188
200	21.9	-0.1	5.0	184
250	22.0	0.1	5.1	177
300	22.0	-0.1	5.1	173
350	22.0	0.2	5.0	169
400	22.1	0.1	4.9	165
450	22.1	0.0	4.8	163
500	22.1	-0.1	4.5	163
550	21.8	-0.1	4.2	164
600	22.1	0.2	4.3	164
650	21.9	-0.2	4.4	165
700	22.1	0.8	4.6	165
750	22.2	-0.4	4.7	167
800	22.2	0.3	4.8	168
850	22.3	0.0	5.1	165
TOWER	22.2	-1.1	2.2	158

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	142	444
2	152	0
3	146	443
4	149	446
5	99	429
6	101	435
7	145	436
8	---	---
9	---	---
10	---	---

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X= 505(M)
Z= 145(M)
R= 123(M)
SLOPE=0.27

AVERAGED METEOROLOGICAL CONDITIONS

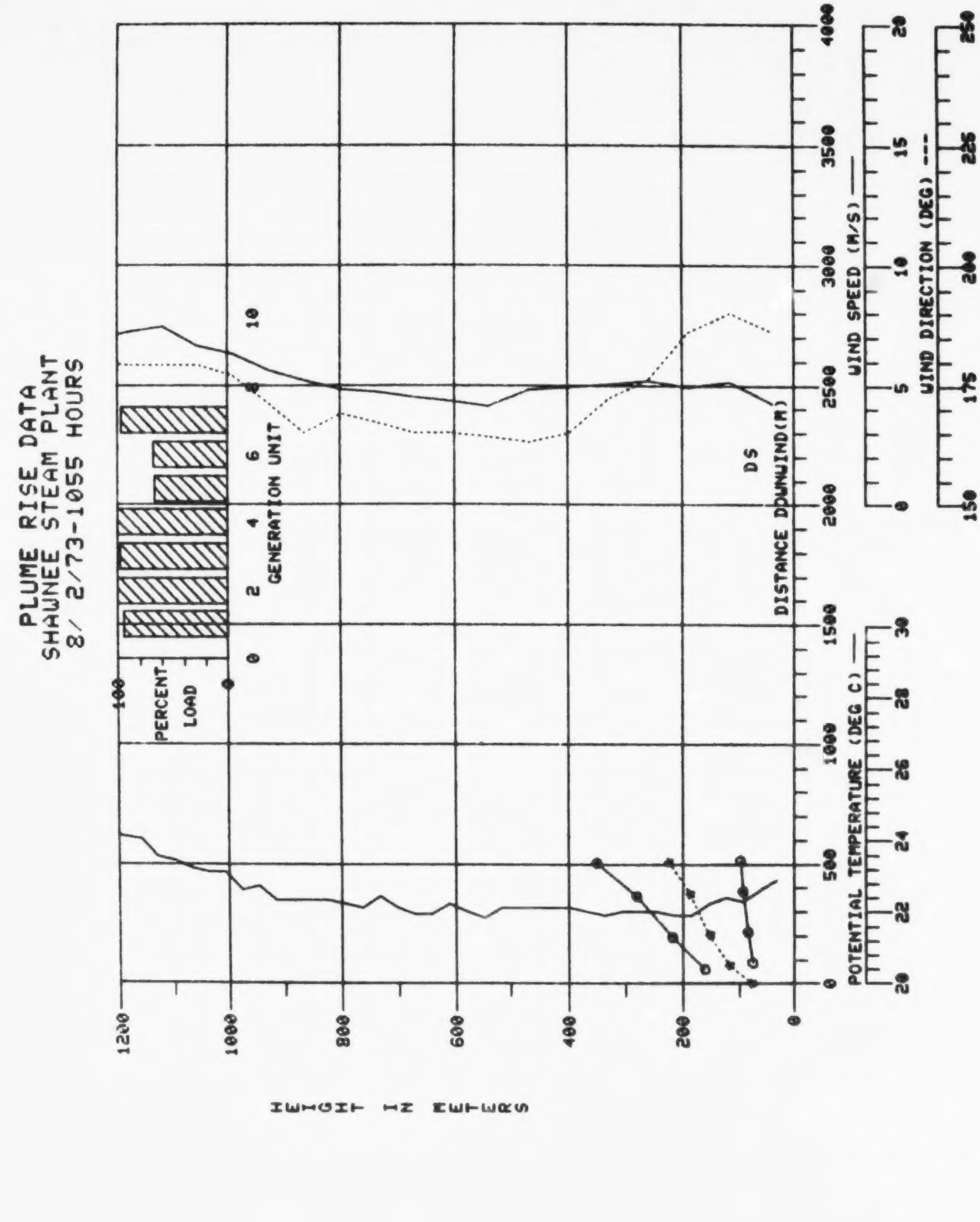
UNIT	1-4
UBAR (M/S)	5.0
DIR (DEG)	181
DT/DZ (C/100M)	-0.18
UA0 (M/S)	4.9
TA0 (K)	295

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
-0.0	-9.0

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	434
VO (M/S)	14.8
FM (M4/S2)	646
FB (M4/S3)	201
LM (M)	5.1
LB (M)	1.6
NO.STACKS	6


PLUME RISE DATA
SHAWNEE STEAM PLANT
8/ 2/73-1055 HOURS
PERCENT LOAD
GENERATION UNIT
DS
DISTANCE DOWNWIND(M)
POTENTIAL TEMPERATURE (DEG C)
WIND SPEED (M/S)
WIND DIRECTION (DEG)

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 8/ 3/73- 755 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 741 - 815 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
89	-2	56	81	72	39	43
224	2	198	135	211	68	67
425	12	404	193	414	102	90
692	22	686	251	689	136	114
LR	LR	1098	283	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 7 BETA= 4 DIR=195

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 740 - POTENTIAL TEMP (C)	GRAD (DC/100M)	PIBALS 745& 815 SPEED (WIND TO) (M/S)	DIR (DEG)
50	19.8	0.7	2.9	173
100	20.2	1.2	4.3	180
150	21.1	2.2	5.3	186
200	22.1	1.5	5.9	191
250	22.6	0.8	5.8	194
300	23.0	0.7	5.7	195
350	23.3	0.5	5.7	195
400	23.5	0.3	5.6	195
450	23.7	0.4	5.6	195
500	23.7	0.2	5.6	195
550	23.8	0.0	5.6	195
600			5.5	194
650			5.3	194
700			5.2	194
750			5.2	193
800			5.2	192
850			5.3	190
TOWER	21.4	1.6	1.8	203

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	113	443
2	139	436
3	139	448
4	96	429
5	106	436
6	58	435
7	100	434
8	94	437
9	86	430
10	83	429

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X= 689(M)
Z= 136(M)
R= 114(M)
SLOPE=0.12

AVERAGED METEOROLOGICAL CONDITIONS

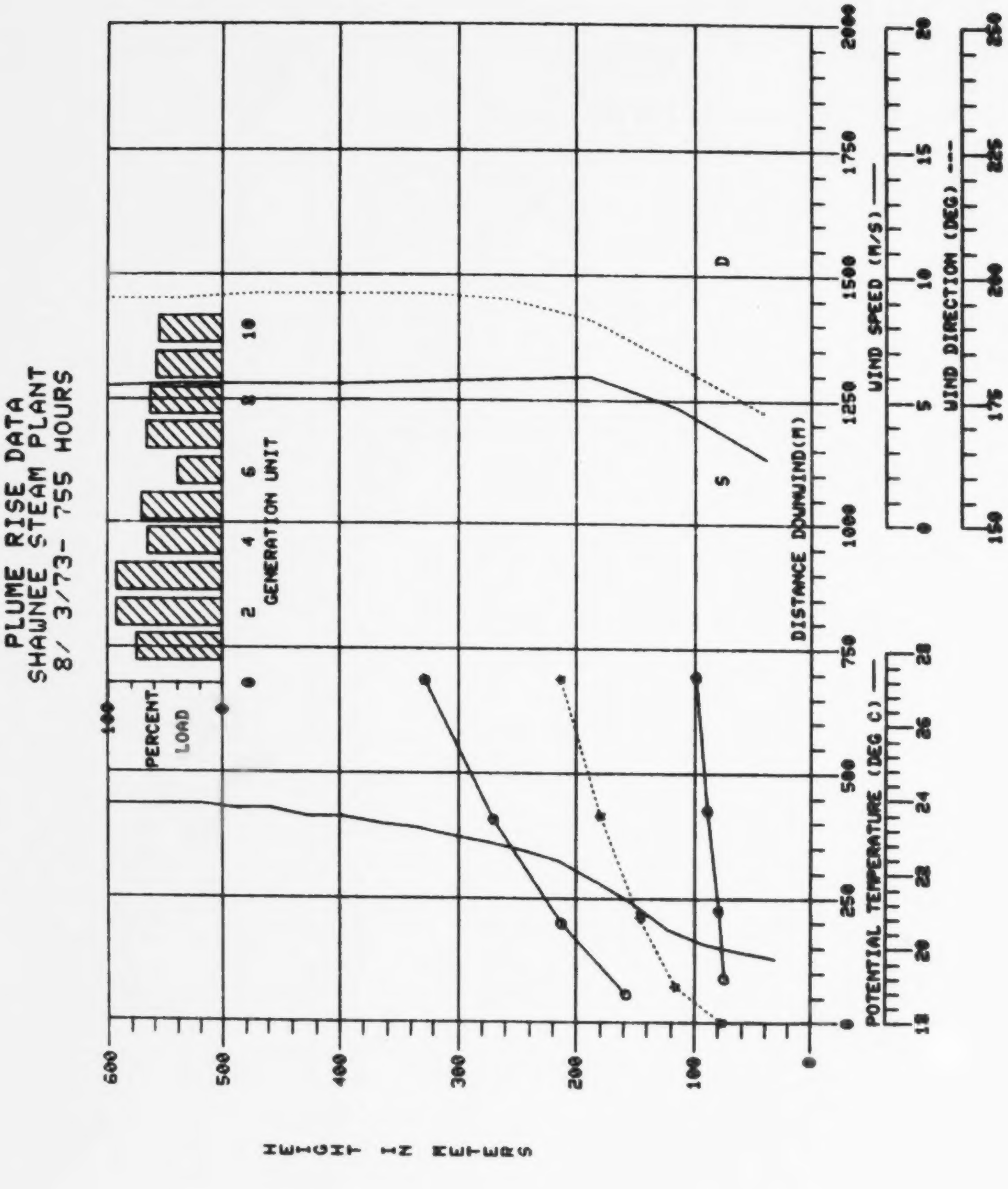
UNIT	1-4
UBAR (M/S)	5.4
DIR (DEG)	190
DT/DZ(C/100M)	1.26
U40 (M/S)	4.4
TA0 (K)	293

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.4	6.5

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	431
VO (M/S)	11.9
FM (M4/S2)	417
FB (M4/S3)	161
LM (M)	3.8
LB (M)	1.0
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
8/ 3/73- 755 HOURS
100
PERCENT
LOAD
0
2
4
6
8
10
GENERATION UNIT
S
D
0
250
500
750
1000
1250
1500
1750
2000
DISTANCE DOWNWIND(M)
0
5
10
15
20
WIND SPEED (M/S)
150
175
200
225
250
WIND DIRECTION (DEG)
18
20
22
24
26
28
POTENTIAL TEMPERATURE (DEG C)
0
100
200
300
400
500
600
HEIGHT IN METERS

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT   8/ 3/73- 855 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 840 - 914 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
81	3	41	96	61	49	49
223	15	187	167	205	91	78
412	27	372	241	392	134	108
598	52	561	297	579	174	123
782	86	756	334	769	210	124
LR	LR	1284	387	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN
STACKS 4 AND 5
CS#= 7 BETA= 0 DIR=190

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 923 - POTENTIAL TEMP (C)	AIRCRAFT - 923 - POTENTIAL GRAD (DC/100M)	PIBALS 844& 905 SPEED (WIND TO) (M/S)	PIBALS 844& 905 DIR (WIND TO) (DEG)
50	22.2	0.1	2.9	164
100	22.3	0.1	3.2	157
150	22.4	0.2	3.7	158
200	22.5	0.7	4.2	162
250	23.3	1.9	4.5	166
300	23.8	0.2	4.5	167
350	23.9	0.3	4.5	167
400	24.0	0.1	4.6	166
450	24.1	0.2	4.7	165
500	24.1	0.2	4.7	165
550	24.3	0.3	4.6	165
600	24.3	-0.2	4.4	165
650	24.4	0.4	4.5	164
700	24.5	0.0	4.5	162
750	24.6	0.5	4.6	159
800	24.9	-0.0	4.7	158
850	24.8	0.2	4.5	156
TOWER	22.8	-1.1	1.8	203

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	136	443
2	152	437
3	150	448
4	107	439
5	139	438
6	60	436
7	126	439
8	115	437
9	122	437
10	106	438

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X= 769(M)
Z= 210(M)
R= 124(M)
SLOPE=0.19

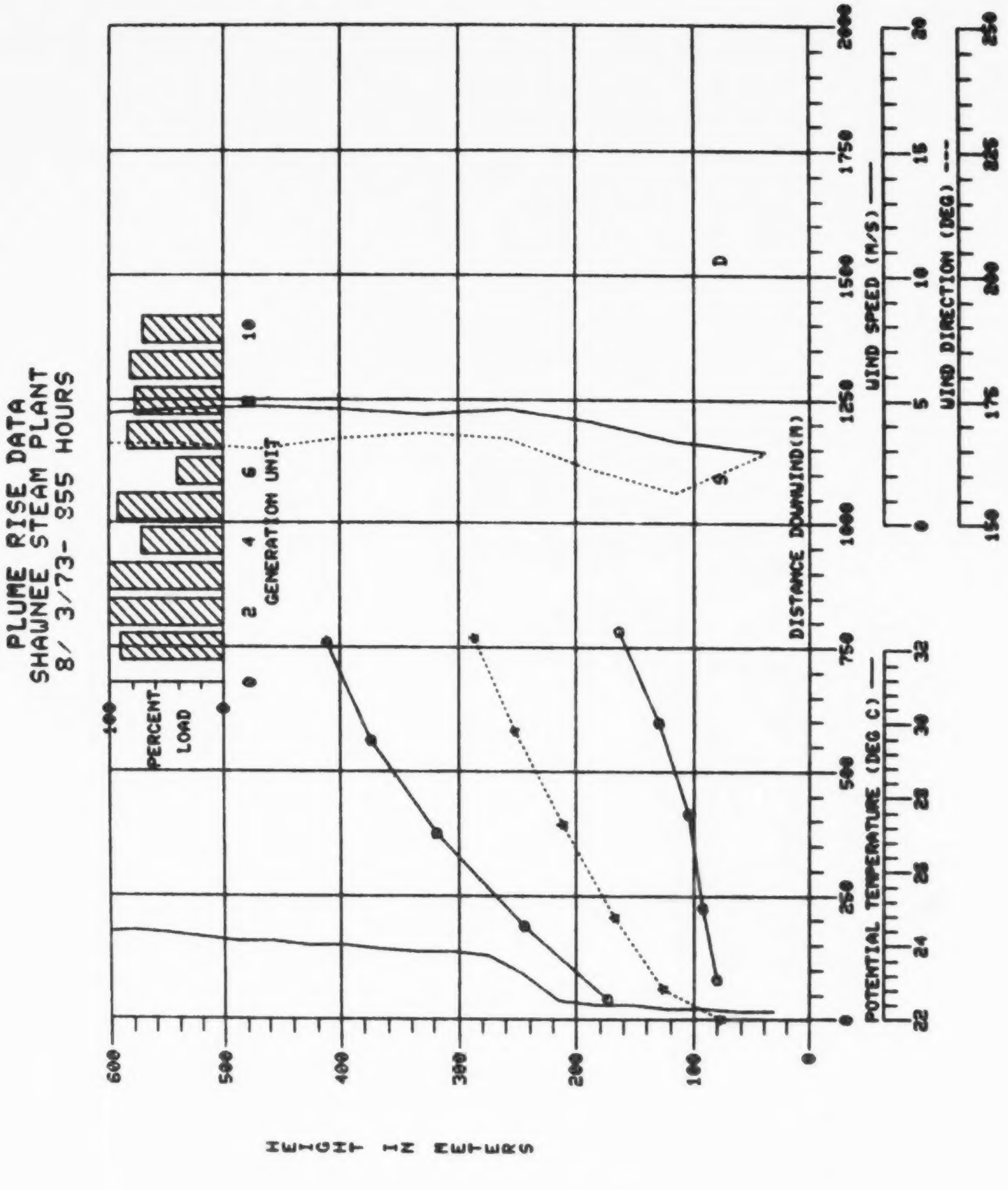
AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	4.1
DIR (DEG)	164
DT/DZ(C/100M)	0.53
UA0 (M/S)	3.3
TA0 (K)	295

WIND SHEAR SPEED (M/S/100M)	WIND SHEAR DIRECTION (DEG/100M)
0.3	2.6

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	434
VO (M/S)	14.1
FM (M4/S2)	581
FB (M4/S3)	190
LM (M)	5.8
LB (M)	2.7
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
8/ 3/73- 955 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
POTENTIAL TEMPERATURE (DEG C)
WIND SPEED (M/S)
WIND DIRECTION (DEG)
D

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 8/ 3/73- 955 HOURS

PHOTOGRAPHIC DETERMINATIONS OF
RELATIVE RISE - TOP & BOTTOM
VS X FOR 940 - 1014 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	CENTER R (M)
83	4	31	113	57	58	59
218	16	170	231	194	123	111
342	4	313	325	327	164	159
LR	LR	737	538	----	---	---
LR	LR	1238	666	----	---	---
LR	LR	1830	695	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN
STACKS 4 AND 5
CS#= 7 BETA= 0 DIR=190

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 1003 - POTENTIAL TEMP (C)	AIRCRAFT - 1003 - GRAD (DC/100M)	PIBALS 955&1010 SPEED (M/S)	PIBALS 955&1010 DIR (WIND TO) (DEG)
50	23.7	-0.1	2.6	181
100	23.7	0.5	2.6	181
150	23.8	0.1	2.6	179
200	23.8	-0.4	2.8	178
250	23.8	0.1	3.0	184
300	23.8	0.1	3.3	188
350	23.9	0.1	3.8	190
400	23.9	0.2	4.3	189
450	24.0	0.1	4.3	188
500	24.1	0.1	4.3	187
550	24.1	0.0	4.4	186
600	24.1	0.2	4.4	187
650	24.3	-0.0	4.4	187
700	24.2	0.3	4.5	188
750	24.4	0.1	4.6	187
800	24.6	0.7	4.7	187
850	25.1	1.2	4.6	186
TOWER	24.2	-2.7	1.3	225

GENERATION AND
PREHEATER EXIT
TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	146	444
2	152	438
3	151	448
4	119	440
5	147	436
6	59	435
7	144	439
8	126	440
9	151	437
10	135	439

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X= 327(M)
Z= 164(M)
R= 159(M)
SLOPE=0.31

AVERAGED METEOROLOGICAL CONDITIONS

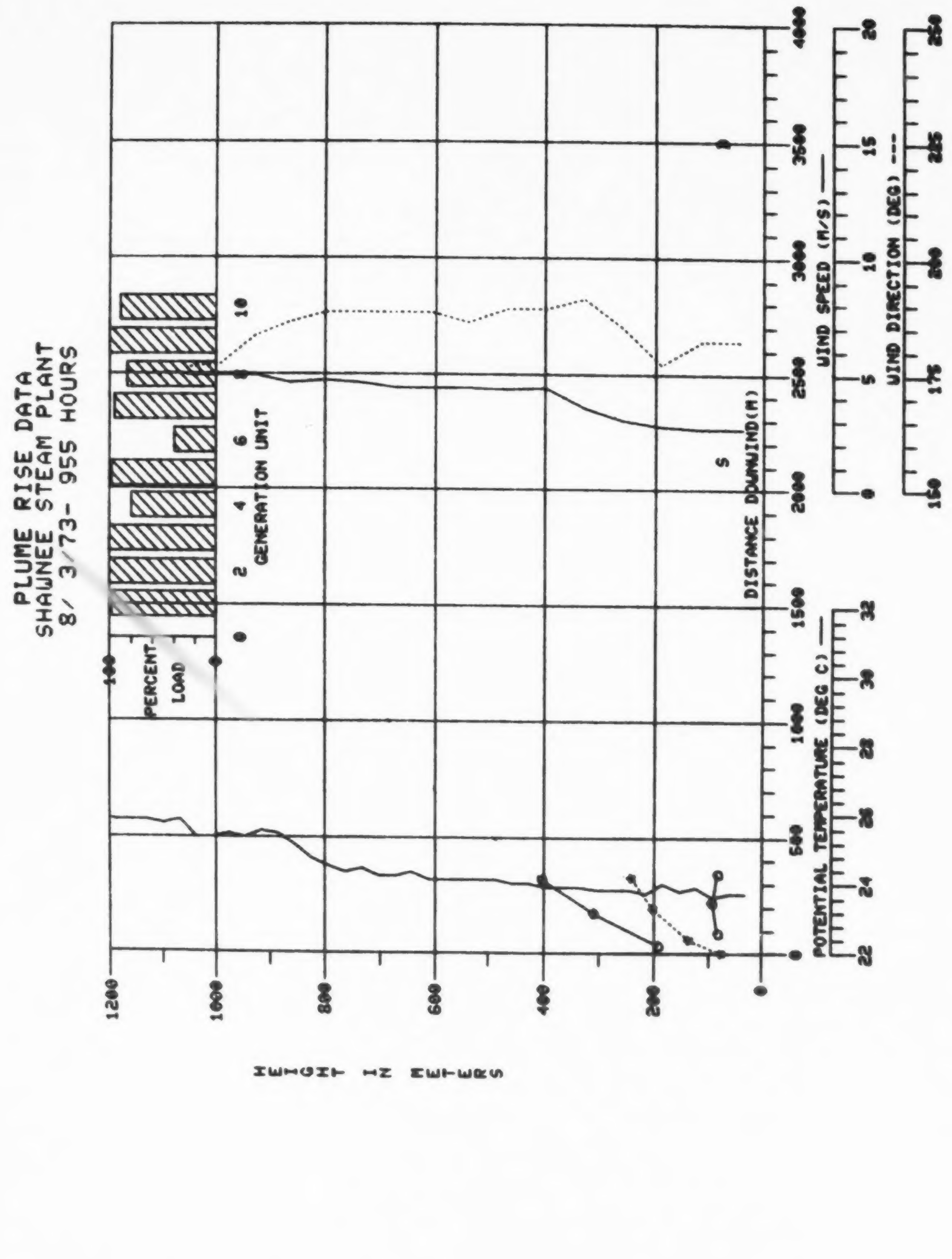
UNIT	1-4
UBAR (M/S)	3.1
DIR (DEG)	184
DT/DZ(C/100M)	0.08
UA0 (M/S)	2.6
TA0 (K)	296

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.6	3.1

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	434
VO (M/S)	15.3
FM (M4/S2)	689
FB (M4/S3)	206
LM (M)	8.4
LB (M)	6.8
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
8/ 3/73- 955 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
WIND SPEED (M/S)
WIND DIRECTION (DEG)
POTENTIAL TEMPERATURE (DEG C)

OBSERVED PLUME RISE AND ATMOSPHERIC DATA

SHAWNEE STEAM PLANT 8/ 3/73-1055 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 1041 - 1115 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	CENTER H (M)
86	1	32	105	59	53	57
243	14	180	222	211	118	108
510	39	415	368	462	203	170
747	80	635	515	691	297	222
LR	LR	1096	737	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5

CS#= 7 BETA= 0 DIR=190

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 1103 - POTENTIAL TEMP (C)	AIRCRAFT GRAD (DC/100M)	PIBALS 1045&1100 SPEED (M/S)	PIBALS DIR (WIND TO) (DEG)
50	24.6	0.2	3.6	199
100	24.6	0.4	4.7	199
150	24.8	0.2	5.4	199
200	24.9	-0.0	5.9	198
250	24.8	-0.1	6.1	198
300	24.7	0.1	5.5	196
350	24.9	0.1	4.7	193
400	24.9	0.2	4.0	188
450	24.9	-0.2	3.9	187
500	24.9	0.2	3.9	187
550	25.0	-0.2	3.9	187
600	24.9	0.1	3.8	187
650	25.1	0.4	4.0	186
700	25.0	-0.5	4.1	185
750	25.0	0.4	4.1	185
800	25.2	-0.3	4.0	184
850	25.0	-0.1	3.8	185
TOWER	25.6	-1.1	1.8	225

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	146	444
2	152	437
3	147	448
4	122	437
5	148	435
6	64	439
7	142	438
8	128	443
9	153	438
10	145	439

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X= 691(M)

Z= 297(M)

H= 222(M)

SLOPE=0.41

AVERAGED METEOROLOGICAL CONDITIONS

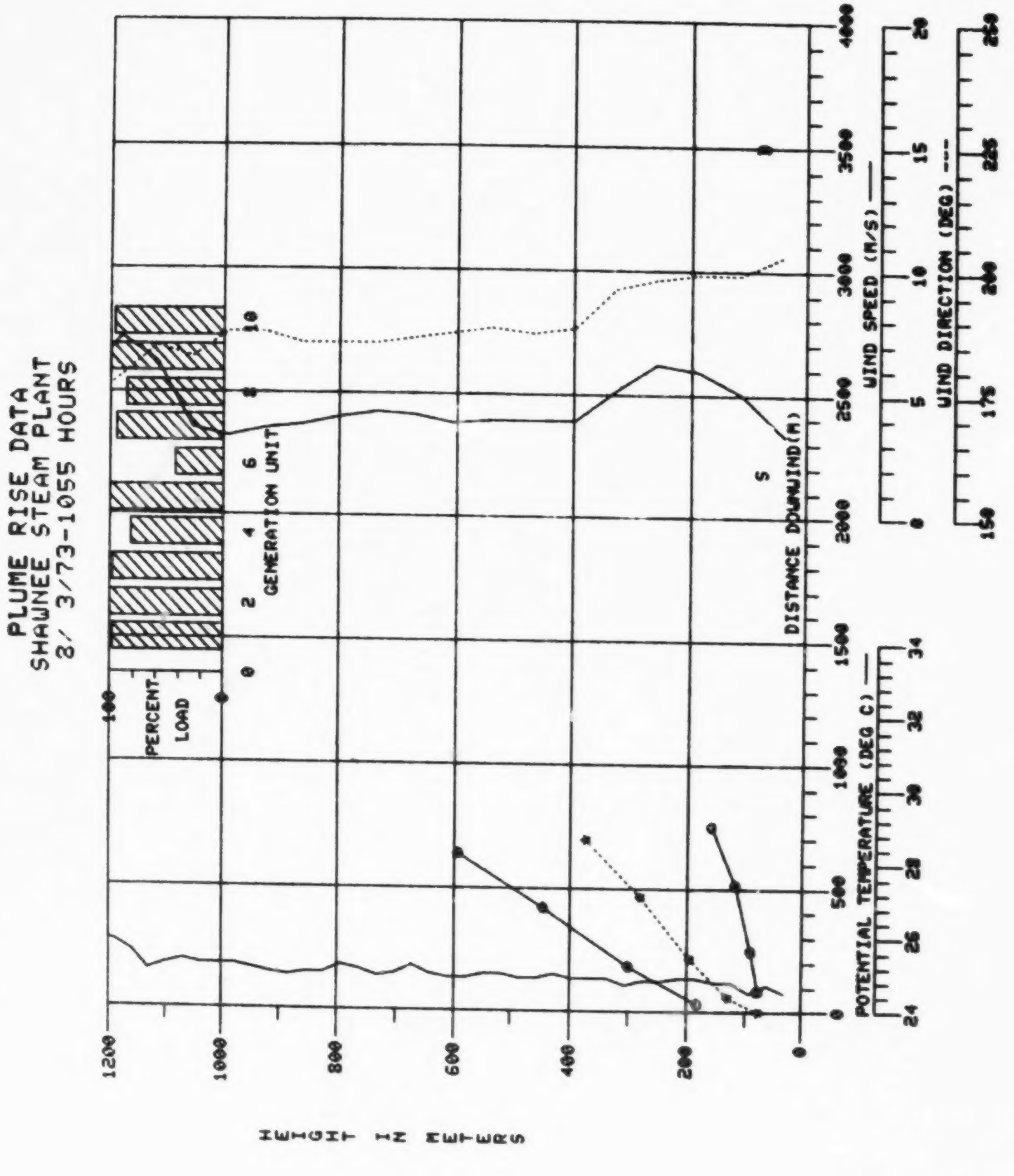
UNIT	1-4
UBAR (M/S)	4.8
DIR (DEG)	193
DT/DZ(C/100M)	0.06
UA0 (M/S)	4.8
TA0 (K)	297

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
-0.4	-3.1

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	434
VO (M/S)	15.4
FM (M4/S2)	701
FB (M4/S3)	206
LM (M)	5.5
LB (M)	1.9
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
8/ 3/73-1055 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND (M)
WIND SPEED (M/S)
WIND DIRECTION (DEG)
POTENTIAL TEMPERATURE (DEG C)
HEIGHT IN METERS
S

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 8/ 3/73-1155 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 1140 - 1212 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
77	0	39	93	58	46	48
229	17	160	204	194	110	99
383	39	291	327	337	183	149
652	89	539	483	595	288	205
866	141	752	592	809	366	232
1022	169	951	666	986	417	249

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 7 HETA=-10 DIR=180

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 1200 - POTENTIAL TEMP (C)	AIRCRAFT - 1200 - GRAD (DC/100M)	PIBALS 1145&1200 SPEED (M/S)	PIBALS 1145&1200 DIR (WIND TO) (DEG)
50	25.6	0.4	2.7	186
100	25.7	-0.6	2.9	172
150	25.3	0.1	3.1	167
200	25.6	0.3	3.5	165
250	25.4	-0.4	3.8	164
300	25.7	0.5	4.0	162
350	25.6	-0.1	4.0	161
400	25.5	0.1	4.2	160
450	25.6	-0.1	4.6	160
500	25.5	0.1	5.1	160
550	25.8	-0.1	5.4	161
600	25.6	0.1	5.6	164
650	25.6	0.1	5.4	167
700	25.5	-0.2	5.0	171
750	25.7	0.2	4.6	177
800	25.6	-0.3	4.3	185
850	25.9	0.9	4.1	185
900	26.0	-0.1	3.8	181
950	25.9	-0.2	3.7	178
1000	25.7	-0.5	3.6	178
TOWER	26.7	-1.1	1.8	158

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	146	447
2	151	437
3	144	448
4	124	437
5	149	436
6	85	435
7	143	439
8	126	440
9	154	437
10	143	441

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X= 986(M)
Z= 417(M)
R= 249(M)
SLOPE=0.29

AVERAGED METEOROLOGICAL CONDITIONS

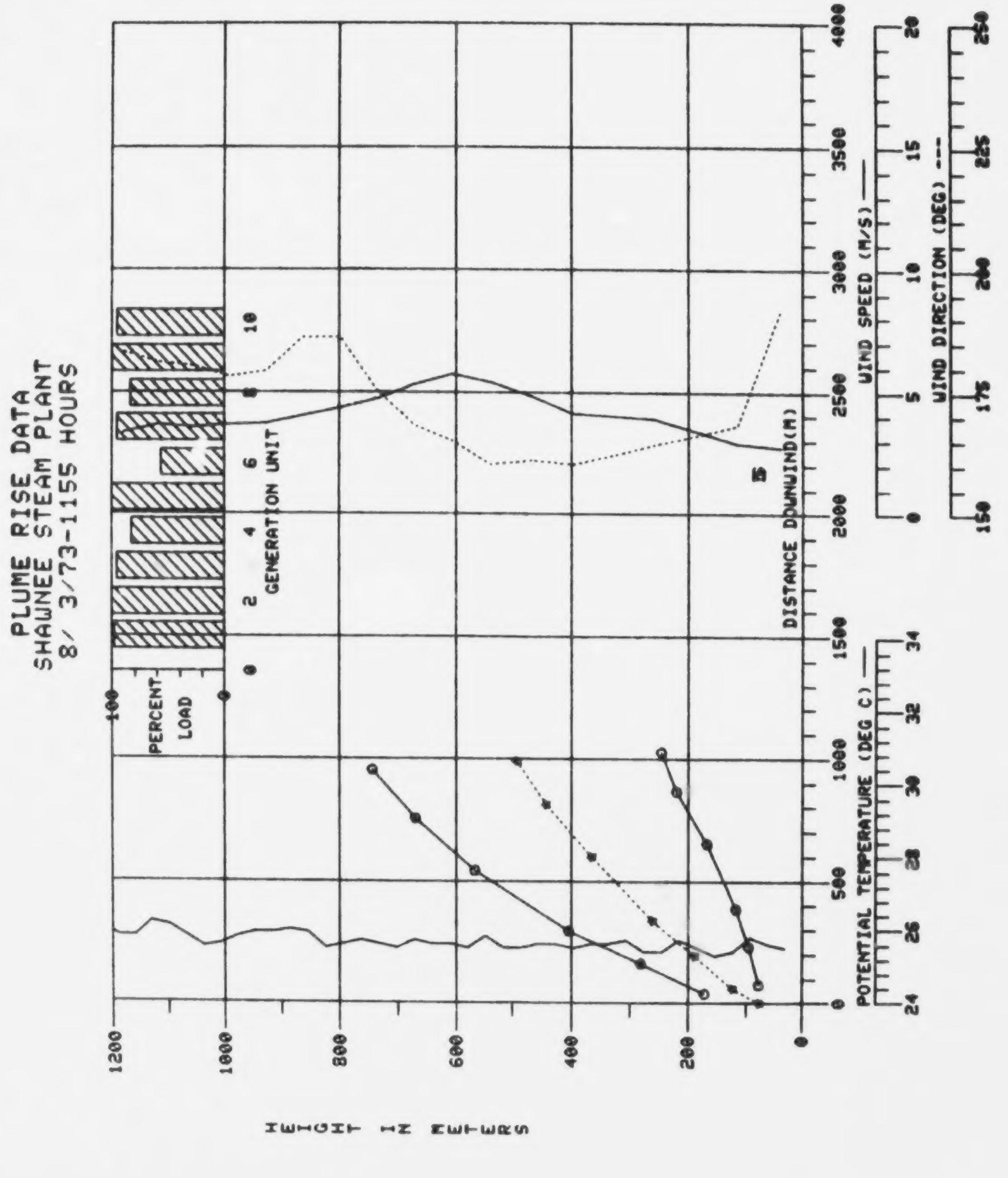
UNIT	1-4
UBAR (M/S)	4.4
DIR (DEG)	165
DT/DZ(C/100M)	-0.01
UAO (M/S)	2.9
TAO (K)	298

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.3	1.9

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	434
VO (M/S)	15.4
FM (M4/S2)	702
FB (M4/S3)	204
LM (M)	6.1
LB (M)	2.4
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
8/ 3/73-1155 HOURS
PERCENT LOAD
100
0
GENERATION UNIT
0
2
4
6
8
10
DISTANCE DOWNWIND(M)
0
500
1000
1500
2000
2500
3000
3500
4000
0
200
400
600
800
1000
1200
POTENTIAL TEMPERATURE (DEG C)
24
26
28
30
32
34
WIND SPEED (M/S)
0
5
10
15
20
WIND DIRECTION (DEG)
150
175
200
225
250

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 8/ 7/73- 715 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 700 - 737 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
20	1	14	21	17	11	10
107	-5	103	43	105	19	24
280	3	275	66	277	34	31
469	8	464	90	466	49	41
656	6	649	101	652	53	47
844	6	843	101	843	53	47

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 8 BETA= -3 DIR= 5

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 700 - POTENTIAL TEMP (C)	AIRCRAFT - 700 - POTENTIAL GRAD (DC/100M)	PIBALS 645& 700 SPEED (M/S)	PIBALS 645& 700 DIR (WIND TO) (DEG)
50	22.8	1.8	7.7	333
100	24.0	2.6	8.4	355
150	25.7	4.6	10.4	6
200	27.5	1.8	12.4	13
250	28.1	1.2	12.2	16
300	28.7	0.9	10.9	17
350	29.0	0.5	9.9	18
400	29.2	0.3	9.7	19
450	29.2	0.0	9.6	20
500	29.2	0.2	9.6	22
550	29.3	0.2	9.5	24
600	29.4	0.0	8.9	28
650	29.4	0.2	8.9	28
700	30.0	0.1	9.1	29
750	29.5	0.1	9.4	28
800	29.5	-0.1	9.4	29
850	29.6	0.2	9.5	30
TOWER	22.8	4.3	2.7	338

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	129	443
2	126	449
3	132	439
4	140	440
5	145	437
6	141	434
7	140	429
8	125	436
9	140	439
10	127	439

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X= 843(M)
Z= 53(M)
R= 47(M)
SLOPE=0.0

AVERAGED METEOROLOGICAL CONDITIONS

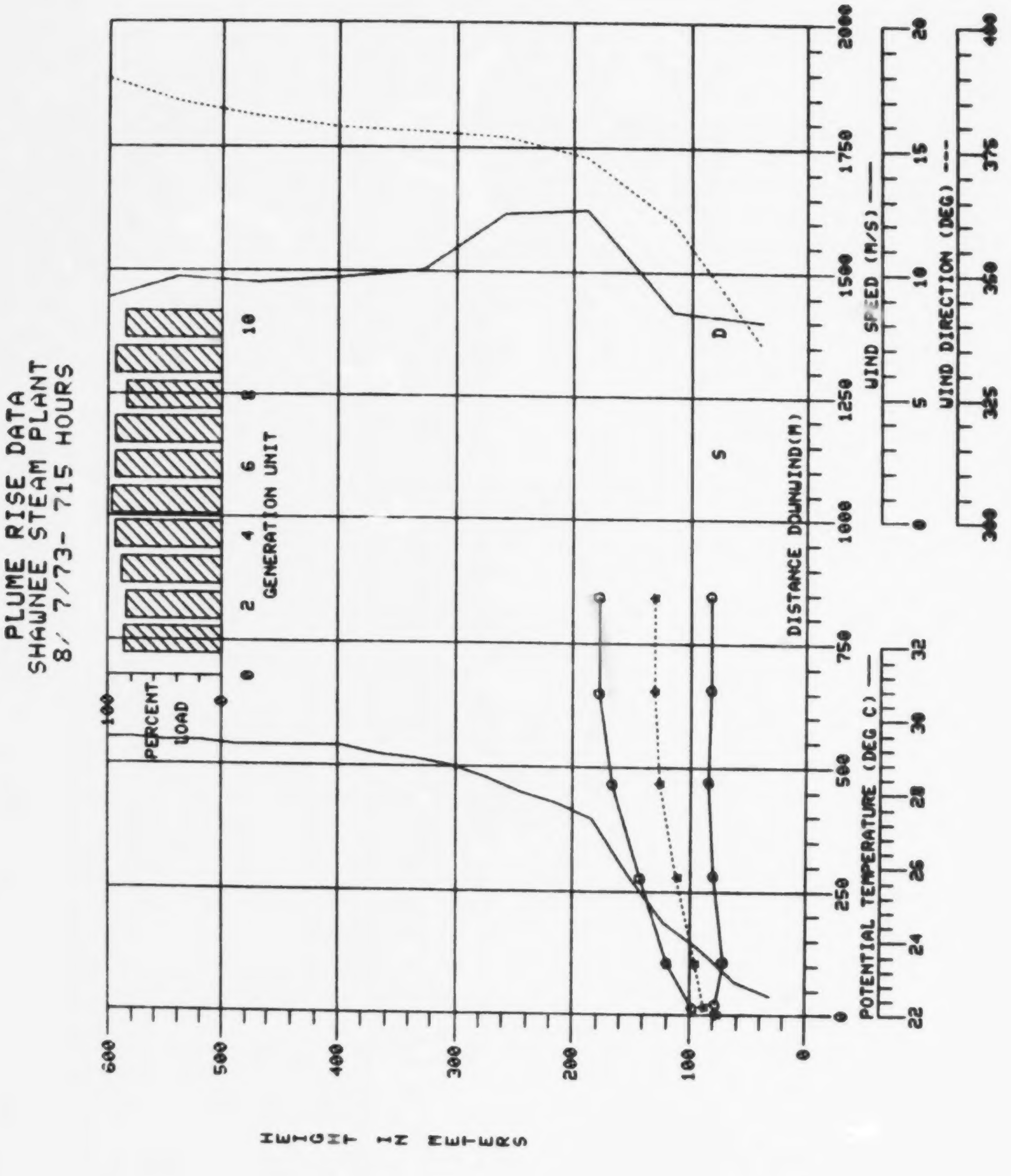
UNIT	1-4
UBAR (M/S)	9.5
DIR (DEG)	1
DT/DZ(C/100M)	3.64
UAV (M/S)	8.5
TAV (K)	296

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
5.6	17.8

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	433
VO (M/S)	14.8
FM (M4/S2)	652
FB (M4/S3)	199
LM (M)	2.7
LB (M)	0.2
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
8/ 7/73- 715 HOURS
PERCENT LOAD
100
0
0 2 4 6 8 10
GENERATION UNIT
S
D
HEIGHT IN METERS
600 500 400 300 200 100 0
0 250 500 750 1000 1250 1500 1750 2000
DISTANCE DOWNWIND(M)
POTENTIAL TEMPERATURE (DEG C) —
22 24 26 28 30 32
WIND SPEED (M/S) —
0 5 10 15 20
WIND DIRECTION (DEG) ---
300 325 350 375 400

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 8/ 7/73- 800 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 746 - 818 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
18	-2	12	29	15	13	14
189	1	182	69	185	35	34
391	-1	386	93	388	46	47
553	7	550	114	551	60	53
714	4	713	126	713	65	60
888	8	885	129	886	68	60

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 8 BETA= -8 DIR= 10

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 800 - POTENTIAL TEMP (C)	AIRCRAFT - 800 - GRAD (DC/100M)	PIBALS 745& 800 SPEED (M/S)	PIBALS 745& 800 DIR (WIND TO) (DEG)
50	24.2	0.4	8.6	360
100	24.6	1.5	9.4	2
150	25.4	1.6	10.1	10
200	26.9	3.9	10.6	19
250	28.1	1.0	10.6	23
300	28.6	0.6	11.1	25
350	28.6	0.1	11.4	25
400	28.7	0.3	11.2	25
450	28.9	0.3	11.0	26
500	29.0	0.1	10.7	26
550	29.1	0.3	10.1	28
600	29.3	0.3	9.2	30
650	29.4	-0.1	9.1	30
700	29.3	0.2	9.1	31
750	29.4	0.1	8.8	31
800	29.5	-0.1	8.7	32
850	29.5	0.2	8.9	33
TOWER	23.6	1.6	2.2	360

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	135	444
2	134	443
3	148	438
4	144	438
5	137	438
6	141	434
7	138	431
8	122	435
9	136	439
10	136	438

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X= 886(M)
Z= 68(M)
R= 60(M)
SLOPE=0.02

AVERAGED METEOROLOGICAL CONDITIONS

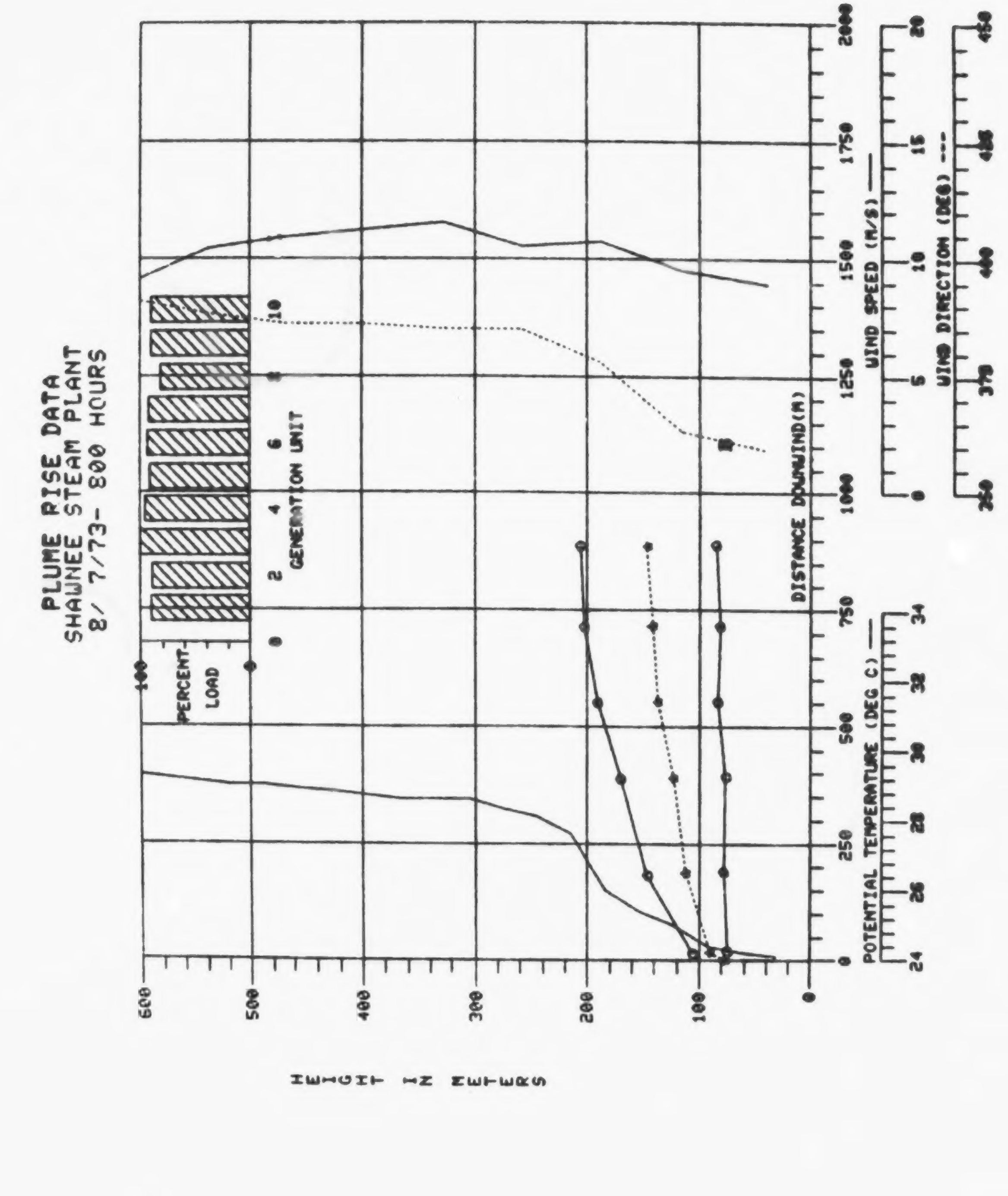
UNIT	1-4
UBAR (M/S)	10.0
DIR (DEG)	9
DT/DZ(C/100M)	2.23
UA0 (M/S)	9.4
TA0 (K)	297

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.7	15.4

AVERAGE EXIT CONDITIONS

UNIT	1-4
T0 (K)	432
V0 (M/S)	15.1
FM (M4/S2)	678
FB (M4/S3)	200
LM (M)	2.6
LB (M)	0.2
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
8/ 7/73- 800 HOURS
PERCENT LOAD
100
0
0 2 4 6 8 10
GENERATION UNIT
DISTANCE DOWNWIND(M)
0 250 500 750 1000 1250 1500 1750 2000
POTENTIAL TEMPERATURE (DEG C) ——
24 26 28 30 32 34
WIND SPEED (M/S) ——
0 5 10 15 20
WIND DIRECTION (DEG) ---
350 370 400 430 450
600 500 400 300 200 100 0
HEIGHT IN METERS

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 8/ 7/73- 900 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 846 - 920 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
27	-2	9	32	18	15	19
123	-7	112	77	117	35	42
245	-8	232	105	238	48	56
454	-8	443	135	448	63	71
676	-5	674	142	675	68	73
877	-2	877	141	877	69	71

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 8 BETA=-13 DIR= 15

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 900 - POTENTIAL TEMP (C)	AIRCRAFT - 900 - POTENTIAL GRAD (DC/100M)	PIBALS 845& 900 SPEED (WIND TO) (M/S)	PIBALS 845& 900 DIR (WIND TO) (DEG)
50	25.9	0.1	9.3	356
100	26.0	0.4	9.8	360
150	26.4	1.0	9.8	8
200	27.1	2.2	10.0	17
250	28.3	1.6	10.2	26
300	28.7	0.5	10.9	30
350	28.9	0.4	11.3	30
400	29.1	0.5	11.2	30
450	29.2	0.0	11.1	30
500	29.2	0.2	11.2	30
550	29.3	0.2	11.2	29
600	29.3	-0.1	10.8	29
650	29.4	0.1	10.9	29
700	29.3	-0.0	11.0	30
750	29.4	0.0	11.1	31
800	29.4	0.2	11.4	32
850	29.7	0.2	12.1	32
TOWER	26.9	0.4	2.2	360

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	136	444
2	130	444
3	139	439
4	136	438
5	144	440
6	140	436
7	131	429
8	108	433
9	143	438
10	142	441

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X=	877(M)
Z=	69(M)
R=	71(M)
SLOPE=	0.00

AVERAGED METEOROLOGICAL CONDITIONS

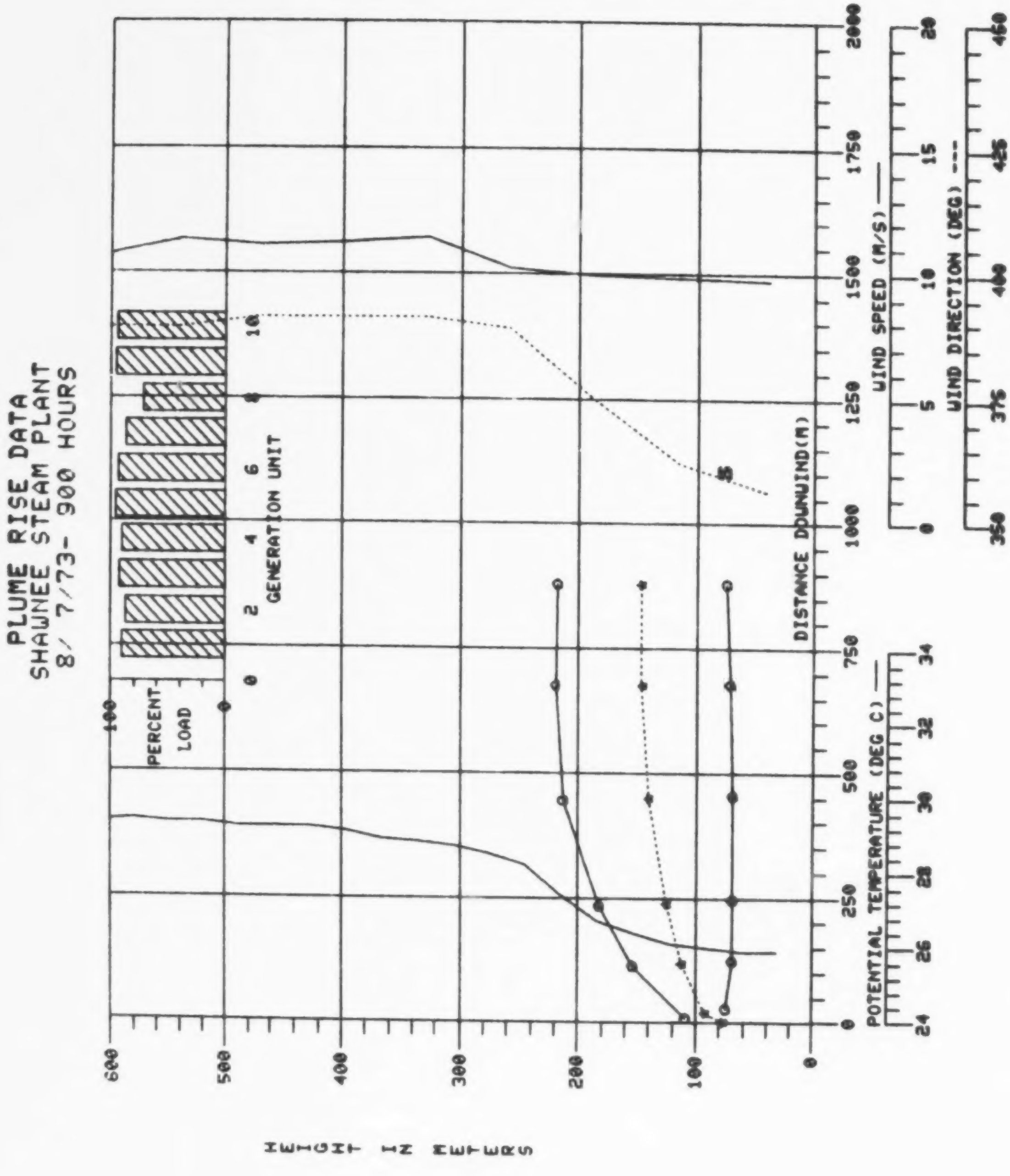
UNIT	1-4
UBAR (M/S)	9.9
DIR (DEG)	8
DT/DZ(C/100M)	1.10
UAO (M/S)	9.8
TAO (K)	293

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.3	18.8

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	433
VO (M/S)	14.9
FM (M4/S2)	664
FB (M4/S3)	197
LM (M)	2.6
LB (M)	0.2
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
8/ 7/73- 900 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
POTENTIAL TEMPERATURE (DEG C)
WIND SPEED (M/S)
WIND DIRECTION (DEG)

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 8/ 7/73-1000 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 945 - 1019 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
24	1	9	27	16	14	14
130	3	117	78	123	40	37
287	4	267	135	277	70	66
469	13	447	183	458	98	85
680	18	662	209	671	113	95
933	30	925	218	929	124	94

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 8 BETA=-18 DIR= 20

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 1000 - POTENTIAL TEMP (C)	AIRCRAFT - 1000 - GRAD (DC/100M)	PIBALS 945&1000 SPEED (M/S)	PIBALS 945&1000 DIR (WIND TO) (DEG)
50	27.9	0.5	4.6	28
100	28.1	0.5	5.2	22
150	28.0	-0.4	6.0	20
200	28.2	0.3	6.8	22
250	28.2	0.2	7.1	22
300	28.3	0.0	7.3	24
350	28.3	0.1	7.8	25
400	28.5	0.3	8.7	28
450	28.5	0.2	9.5	30
500	28.8	0.7	10.1	32
550	29.2	0.6	10.3	34
600	29.3	0.1	9.9	35
650	29.4	0.1	9.7	38
700	29.5	0.3	9.7	40
750	29.6	0.1	9.9	39
800	29.7	0.3	10.2	38
850	29.8	0.0	10.1	37
TOWER	29.4	-0.2	2.2	360

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	138	445
2	133	441
3	142	443
4	147	439
5	139	440
6	144	437
7	140	429
8	110	435
9	140	438
10	145	441

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X= 929(M)
Z= 124(M)
R= 94(M)
SLOPE=0.04

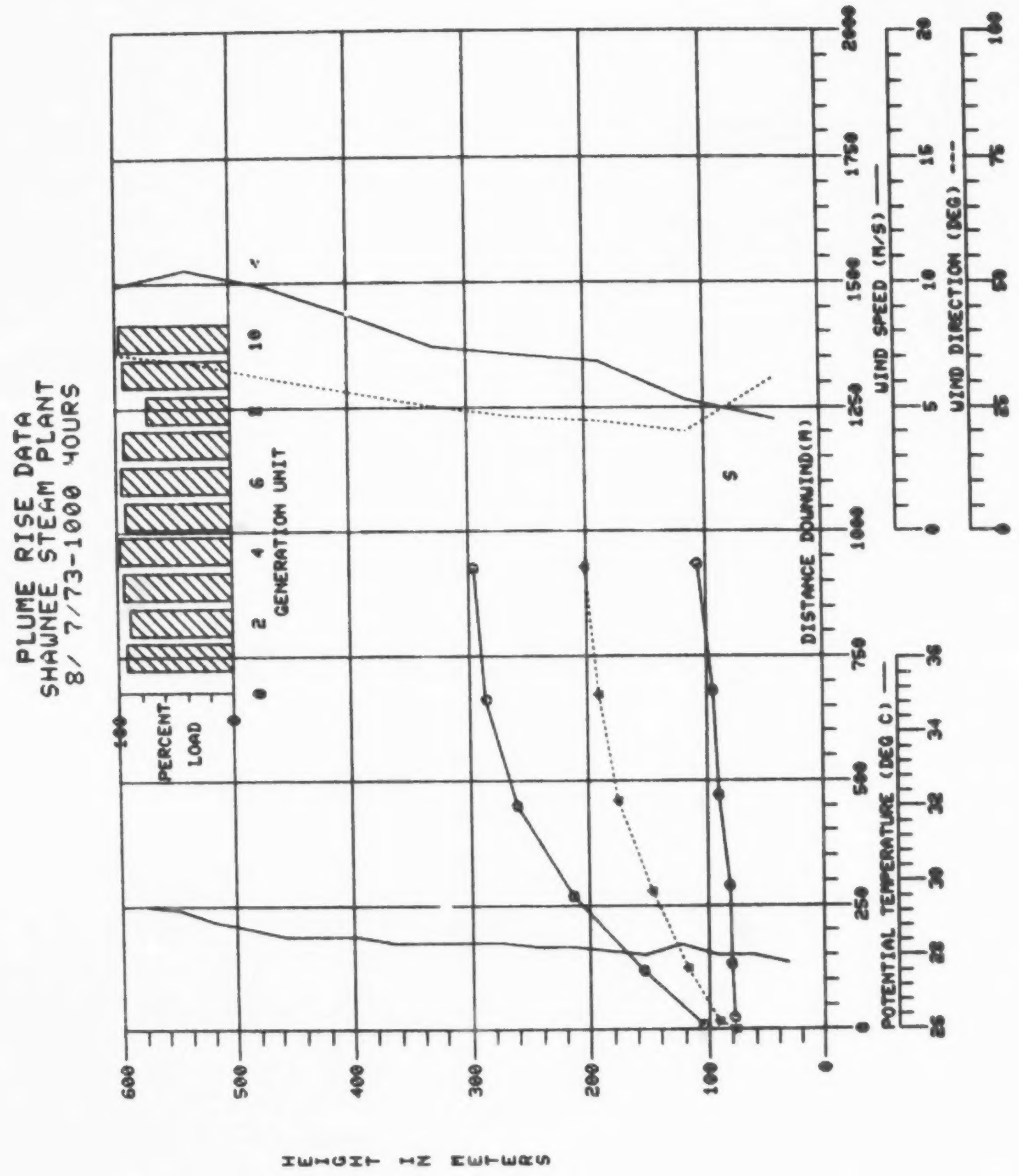
AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	6.4
DIR (DEG)	22
DT/DZ(C/100M)	0.14
UA0 (M/S)	5.2
TA0 (K)	301

WIND SHEAR SPEED (M/S/100M)	WIND SHEAR DIRECTION (DEG/100M)
0.9	2.3

AVERAGE EXIT CONDITIONS

UNIT	1-4
T0 (K)	433
V0 (M/S)	15.3
FM (M4/S2)	700
FB (M4/S3)	197
LM (M)	4.2
LB (M)	0.8
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
8/ 7/73-1000 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
WIND SPEED (M/S) —
WIND DIRECTION (DEG) ---
POTENTIAL TEMPERATURE (DEG C) —
HEIGHT IN METERS

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 8/ 7/73-1050 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 1045 - 1101 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
24	-5	9	20	16	7	13
118	-14	86	63	102	24	41
229	-16	182	132	205	58	77
357	-22	307	209	332	93	118
LR	LR	613	355	----	---	---
LR	LR	822	438	----	---	---
LR	LR	1065	453	----	---	---
LR	LR	1416	444	----	---	---
LR	LR	1734	435	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 8 BETA=-18 DIR= 20

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 1110 - POTENTIAL TEMP (C)	AIRCRAFT GRAD (DC/100M)	PIBALS 1045&1100 SPEED (M/S)	PIBALS DIR (WIND TO) (DEG)
50	29.1	0.8	9.6	15
100	29.3	0.1	10.3	14
150	29.3	-0.1	10.1	15
200	29.3	0.2	9.6	16
250	29.3	-0.0	8.7	16
300	29.2	-0.1	6.8	19
350	29.3	0.0	5.4	22
400	29.2	0.2	5.0	24
450	29.3	-0.3	4.4	24
500	29.1	-0.4	4.4	29
550	29.2	0.3	4.8	34
600	29.3	0.1	5.2	33
650	29.2	0.0	5.1	37
700	29.7	1.0	5.5	40
750	29.9	0.2	6.7	40
800	30.0	0.6	8.3	39
850	30.2	0.1	8.6	36
TOWER	31.1	-0.2	2.2	23

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	144	449
2	140	444
3	128	438
4	140	441
5	142	438
6	137	437
7	132	432
8	124	436
9	127	439
10	132	441

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X= 332(M)
Z= 93(M)
R= 119(M)
SLOPE=0.28

AVERAGED METEOROLOGICAL CONDITIONS

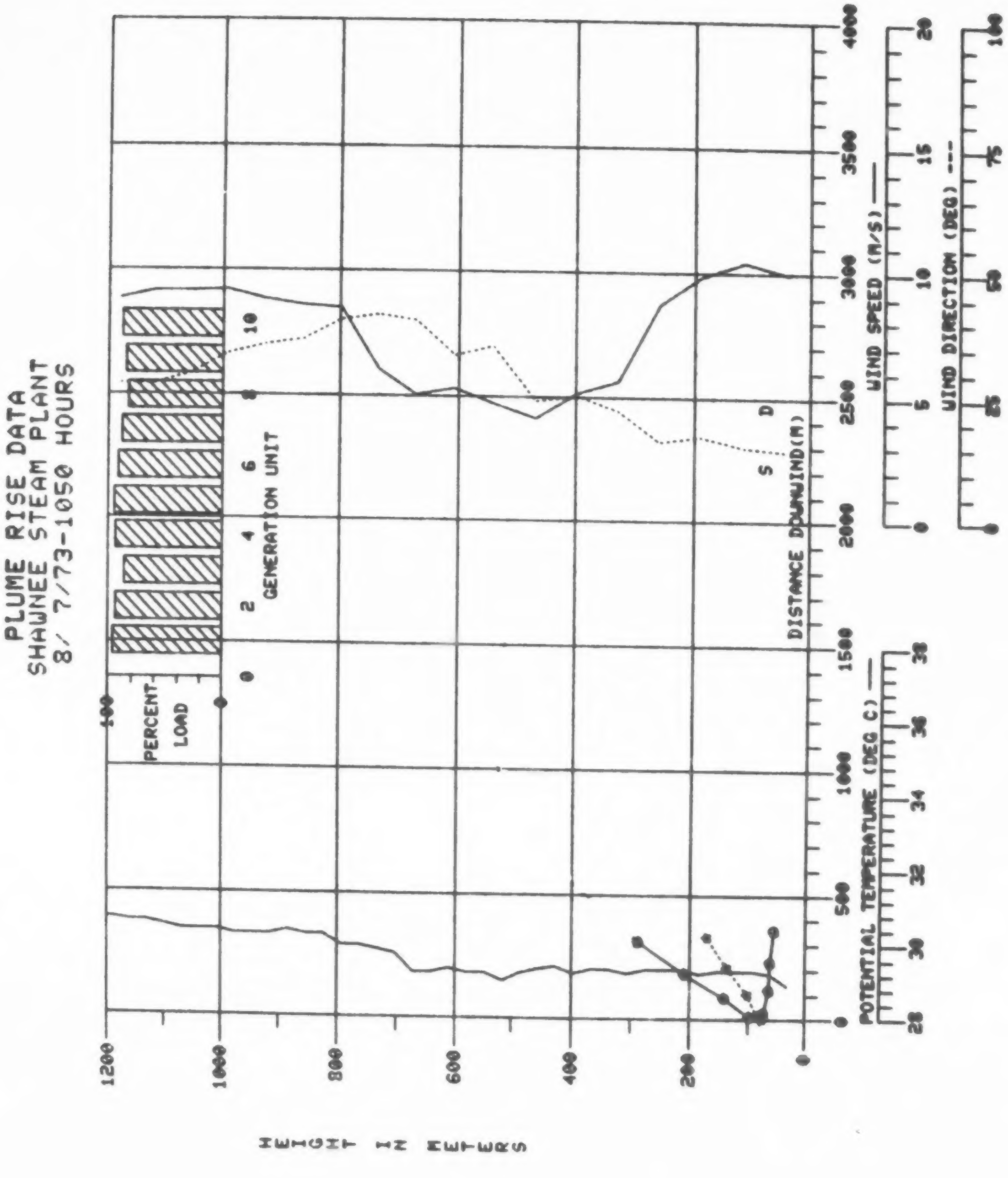
UNIT	1-4
UBAR (M/S)	9.6
DIR (DEG)	16
DT/DZ(C/100M)	0.01
UA0 (M/S)	10.3
TA0 (K)	302

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
-2.2	2.8

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	434
VO (M/S)	14.9
FM (M4/S2)	669
FB (M4/S3)	192
LM (M)	2.7
LB (M)	0.2
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
8/ 7/73-1050 HOURS
PERCENT LOAD
100
0
GENERATION UNIT
0
2
4
6
8
10
S
D
DISTANCE DOWNWIND(M)
0
500
1000
1500
2000
2500
3000
3500
4000
WIND SPEED (M/S)
0
5
10
15
20
WIND DIRECTION (DEG)
0
25
50
75
100
POTENTIAL TEMPERATURE (DEG C)
28
30
32
34
36
38
HEIGHT IN METERS
0
200
400
600
800
1000
1200

OBSERVED PLUME RISE AND ATMOSPHERIC DATA

SHAWNEE STEAM PLANT 8/15/73- 900 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 846 - 920 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
92	5	33	127	62	66	67
273	-4	165	273	219	134	148
522	7	363	463	442	235	239
743	35	560	562	651	298	276
954	71	855	562	904	316	246
1125	105	1121	517	1123	311	206
1356	138	1355	487	1355	312	174
1501	139	1499	487	1500	313	174
LR	LR	1756	478	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5

CS#= 9 BETA= 19 DIR=215

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 900 - POTENTIAL TEMP (C)	GRAD (DC/100M)	PIBALS 845& 905 SPEED (M/S)	DIR (WIND TO) (DEG)
50	22.1	-0.3	1.6	264
100	22.1	0.3	1.8	266
150	22.3	0.9	2.1	265
200	23.0	1.3	2.3	265
250	23.5	0.4	2.3	268
300	23.8	0.7	2.2	271
350	24.0	0.3	2.1	273
400	24.1	0.5	1.9	272
450	24.4	0.5	1.7	266
500	24.7	0.7	1.4	241
550	25.0	0.5	1.2	216
600	25.2	0.6	1.3	215
650	25.5	0.5	1.4	217
700	25.8	0.5	1.5	215
750	26.0	0.3	1.5	211
800	26.1	0.3	1.5	210
850	26.2	0.3	1.7	217
TOWER	22.8	-1.1	0.9	225

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	90	436
2	145	436
3	148	436
4	147	435
5	144	439
6	146	433
7	146	428
8	126	435
9	146	431
10	152	437

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X=1500(M)
Z= 313(M)
R= 174(M)
SLOPE=0.01

AVERAGED METEOROLOGICAL CONDITIONS

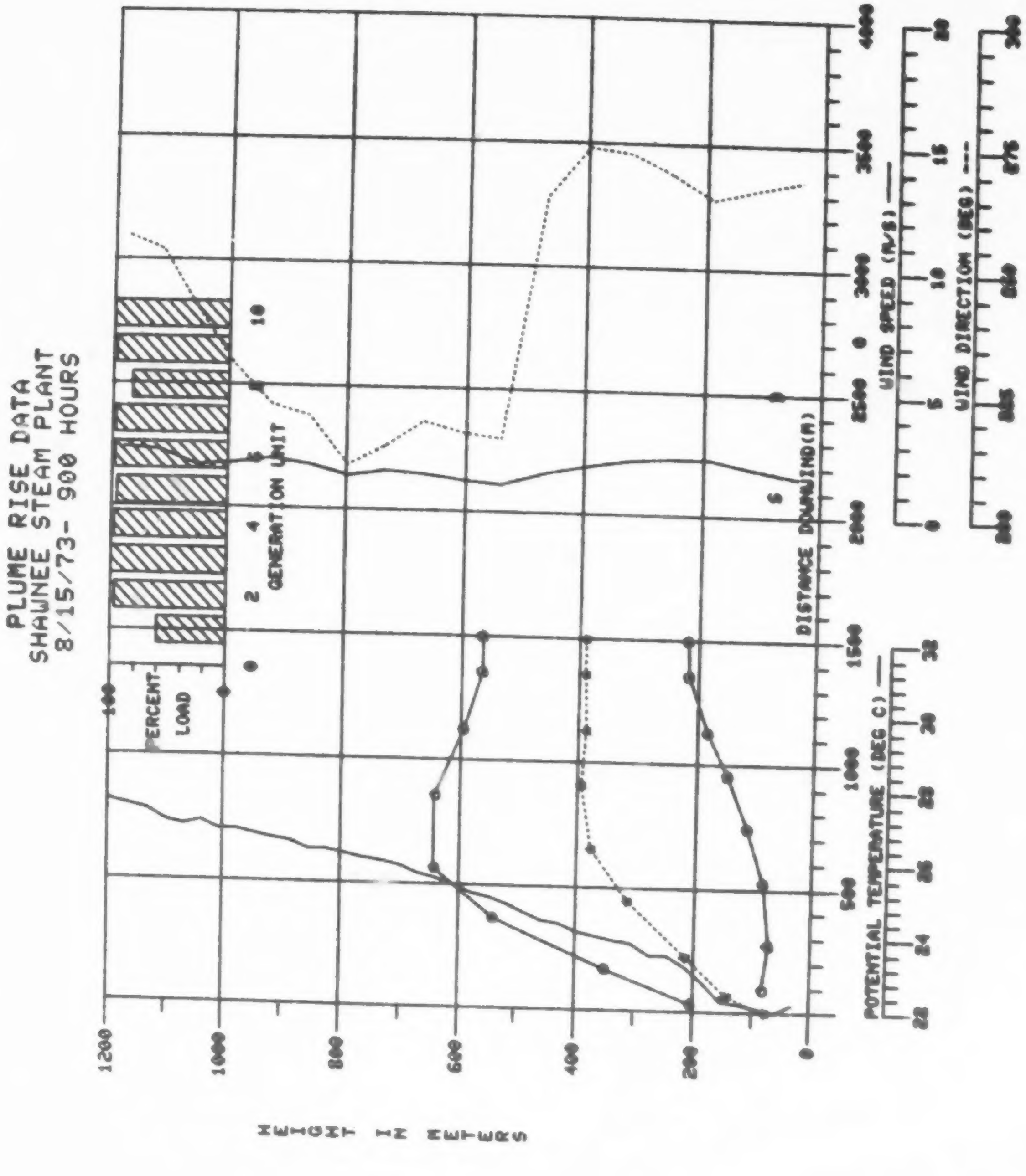
UNIT	1-4
UBAR (M/S)	1.9
DIR (DEG)	262
DT/DZ(C/100M)	0.62
UA0 (M/S)	1.9
TA0 (K)	295

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
-0.2	-10.3

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	429
V0 (M/S)	15.4
FM (M4/S2)	703
FB (M4/S3)	203
LM (M)	13.9
LB (M)	29.0
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
8/15/73- 900 HOURS
PERCENT LOAD
100
0 2 4 6 8 10
GENERATION UNIT
DISTANCE DOWNWIND(M)
500 1000 1500 2000 2500 3000 3500 4000
POTENTIAL TEMPERATURE (DEG C)
22 24 26 28 30 32
WIND SPEED (M/S)
0 5 10 15 20
WIND DIRECTION (DEG)
HEIGHT IN METERS
0 200 400 600 800 1000 1200

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 8/16/73- 900 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 846 - 918 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
87	-2	63	68	75	33	36
242	-3	219	112	230	54	58
466	10	432	170	449	90	81
680	22	646	216	663	119	98
877	40	855	252	866	146	106
1176	47	1148	294	1162	170	124
1392	43	1373	319	1382	181	138
1649	41	1641	331	1645	186	145
1896	34	1898	349	1897	191	157

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 7 BETA= -4 DIR=335

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 900 - POTENTIAL TEMP (C)	AIRCRAFT GRAD (DC/100M)	PIBALS 845& 900 SPEED (WIND TO) (M/S)	PIBALS DIR (DEG)
50	23.9	0.6	5.5	340
100	24.2	0.6	5.7	339
150	24.6	1.1	6.2	339
200	25.4	1.7	6.8	338
250	25.8	0.5	6.7	336
300	26.1	0.3	6.6	334
350	26.3	0.3	6.5	332
400	26.3	0.2	6.2	331
450	26.4	0.1	6.0	331
500	26.5	0.1	5.8	332
550	26.6	0.5	5.6	334
600	26.8	-0.0	5.1	334
650	26.7	0.1	5.1	334
700	26.9	0.5	5.1	333
750			5.1	331
800			5.0	331
850			4.9	334
TOWER	23.8	-0.2	1.8	338

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	146	449
2	150	444
3	112	440
4	153	441
5	151	446
6	145	438
7	118	422
8	124	438
9	98	421
10	100	445

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X=1897(M)
Z= 191(M)
R= 157(M)
SLOPE=0.02

AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	6.4
DIR (DEG)	336
DT/DZ(C/100M)	0.67
UA0 (M/S)	5.7
TA0 (K)	297

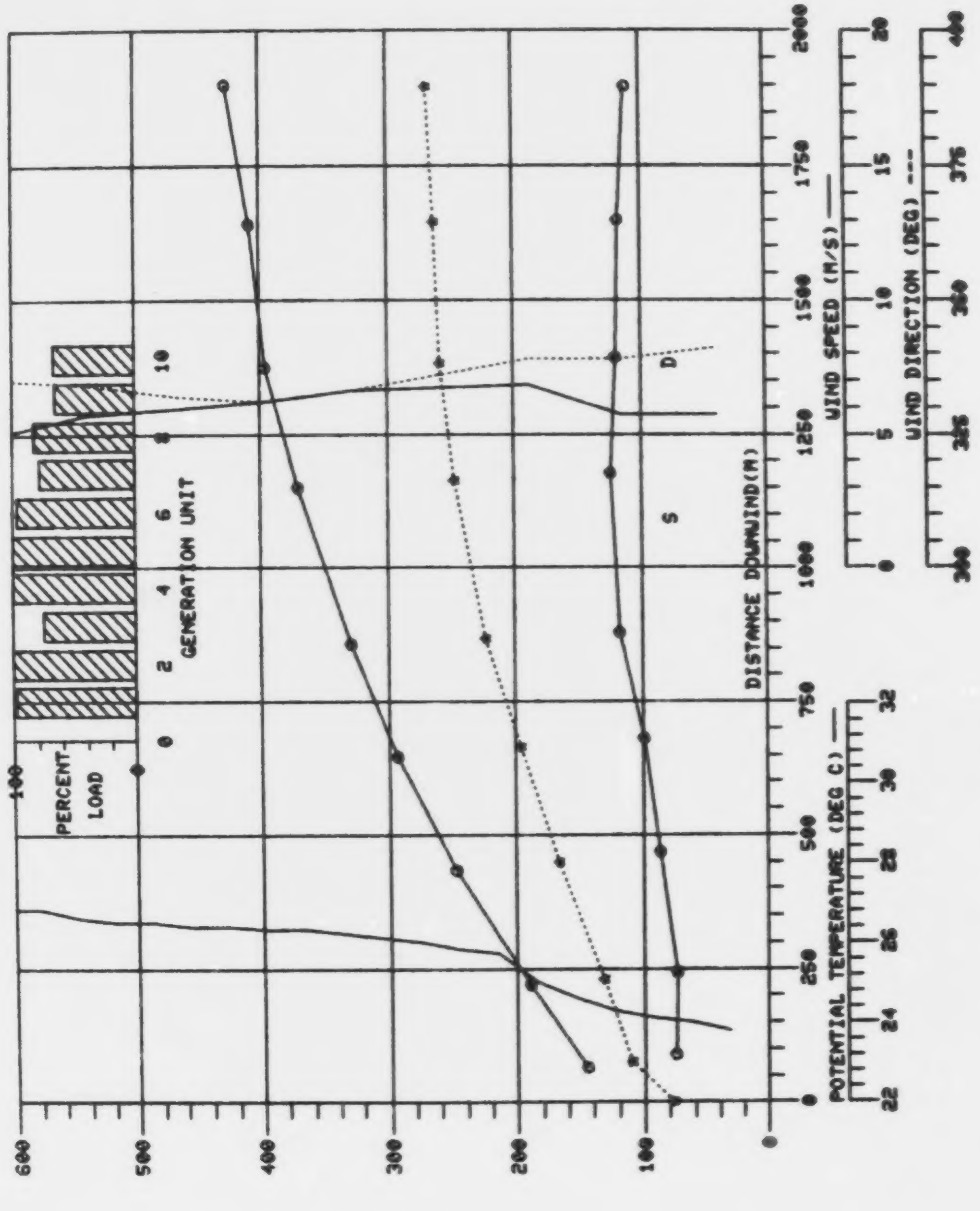
WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
-0.0	-2.5

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	433
V0 (M/S)	14.7
FM (M4/S2)	642
FB (M4/S3)	196
LM (M)	4.0
LB (M)	0.8
NO.STACKS	10

PLUME RISE DATA
SHAWNEE STEAM PLANT
8/16/73- 900 HOURS



OBSERVED PLUME RISE AND ATMOSPHERIC DATA

SHAWNEE STEAM PLANT 8/16/73-1000 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 946 - 1020 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
71	-6	22	110	46	52	62
233	16	166	213	199	114	103
382	30	304	295	343	162	137
576	56	548	378	562	217	161
896	66	885	445	890	255	188
1254	87	1262	447	1258	267	180
1532	50	1562	435	1547	242	193

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5

CS#= 7 BETA= -4 DIR=345

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 1000 - POTENTIAL TEMP (C)	AIRCRAFT - 1000 - GRAD (DC/100M)	PIBALS 945&1000 SPEED (M/S)	PIBALS 945&1000 DIR (WIND TO) (DEG)
50	25.5	0.1	3.3	325
100	25.7	0.5	3.7	325
150	25.7	-0.0	4.2	327
200	25.7	-0.3	4.7	330
250	25.6	0.4	5.0	332
300	25.9	-0.2	5.3	333
350	25.8	0.4	5.6	333
400	26.0	0.8	5.8	334
450	26.5	0.6	5.7	334
500	26.6	-0.0	5.5	334
550	26.7	0.5	5.4	334
600	26.7	-0.2	5.2	334
650	26.7	0.2	5.1	335
700	26.9	0.3	5.0	336
750	27.1	0.2	4.8	336
800	27.0	0.1	4.6	336
850	27.1	0.0	4.6	336
TOWER	25.9	-0.6	1.3	338

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	122	446
2	150	444
3	112	443
4	153	439
5	138	441
6	135	438
7	119	426
8	125	438
9	98	424
10	100	439

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X=1547(M)
Z= 242(M)
R= 193(M)
SLOPE=0.0

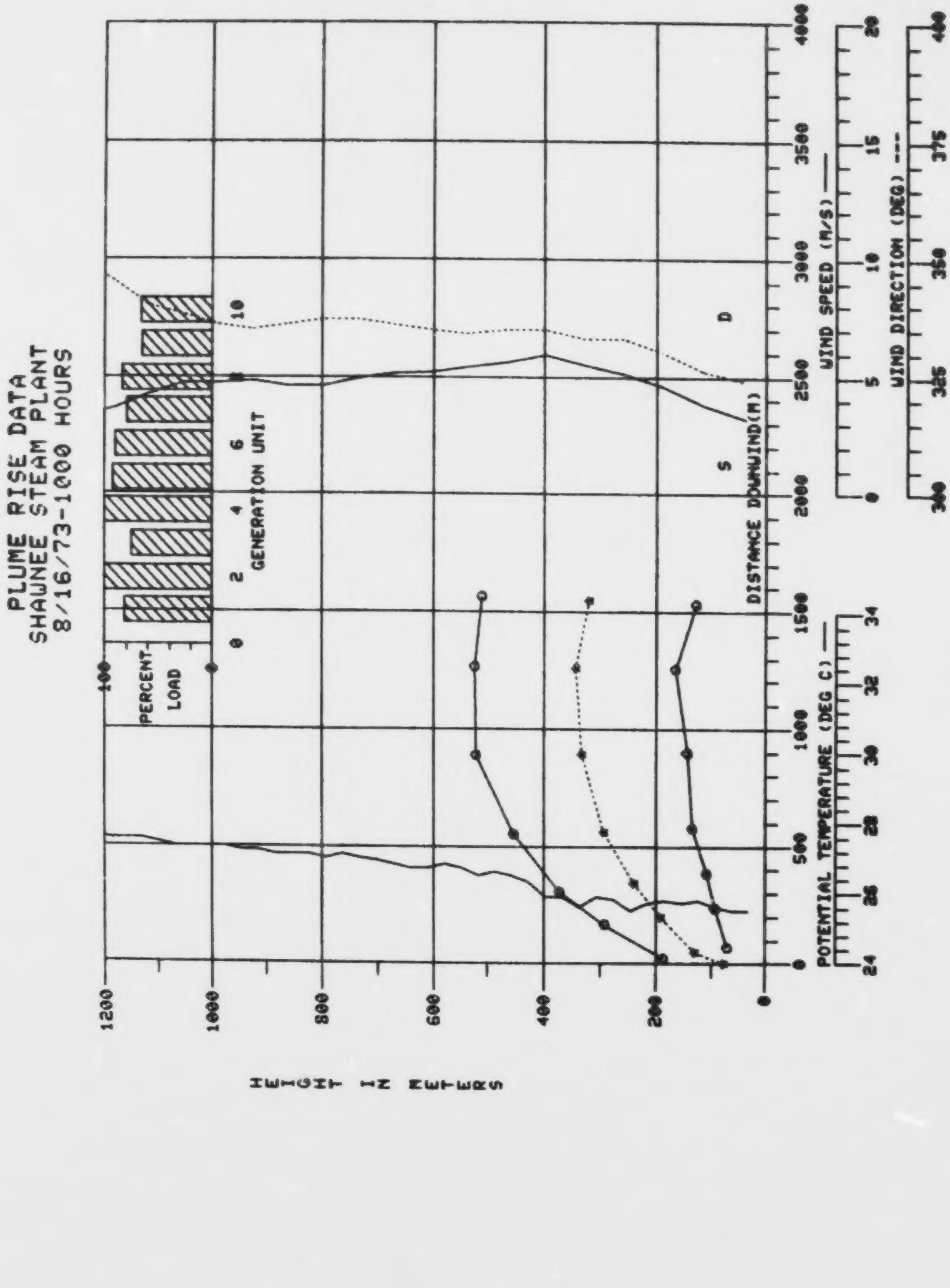
AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	5.1
DIR (DEG)	332
DT/DZ(C/100M)	0.23
UA0 (M/S)	3.7
TA0 (K)	298

WIND SHEAR SPEED (M/S/100M)	WIND SHEAR DIRECTION (DEG/100M)
0.4	1.8

AVERAGE EXIT CONDITIONS

UNIT	1-4
T0 (K)	432
V0 (M/S)	14.1
FM (M4/S2)	595
FB (M4/S3)	185
LM (M)	4.8
LB (M)	1.4
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
8/16/73-1000 HOURS
PERCENT LOAD
100
0
0
2
4
6
8
10
GENERATION UNIT
S
D
DISTANCE DOWNWIND(M)
0
500
1000
1500
2000
2500
3000
3500
4000
1200
1000
800
600
400
200
0
POTENTIAL TEMPERATURE (DEG C)
24
26
28
30
32
34
WIND SPEED (M/S)
0
5
10
15
20
WIND DIRECTION (DEG)
300
325
350
375
400

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 8/16/73-1100 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 1045 - 1119 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
68	-1	25	87	46	43	48
219	5	139	186	179	95	99
424	17	283	336	353	176	173
640	66	475	499	557	282	231
874	100	688	618	781	359	274
1157	104	1033	761	1095	432	334

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 7 BETA= 0 DIR=345

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 1100 - POTENTIAL TEMP (C)	AIRCRAFT GRAD (DC/100M)	PIBALS 1045&1100 SPEED (WIND TO) (M/S)	PIBALS DIR (DEG)
50	26.5	0.1	3.0	324
100	26.7	0.5	3.5	328
150	26.9	0.3	3.7	326
200	26.9	-0.5	3.6	326
250	26.6	-0.2	3.6	329
300	26.6	-0.1	3.7	329
350	26.5	0.1	3.7	325
400	26.7	0.1	3.6	321
450	26.7	0.2	3.5	319
500	26.7	0.3	3.4	317
550	27.0	-0.0	3.3	317
600	26.7	-0.2	3.6	321
650	26.8	0.3	3.8	323
700	26.8	0.1	3.9	324
750			3.9	325
800			3.8	327
850			4.0	328
900			3.9	330
950			3.9	333
1000			3.7	335
1050			3.5	336
1100			3.4	336
1150			3.1	340
TOWER	28.0	0.4	1.8	338

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	115	444
2	152	445
3	111	441
4	152	439
5	135	444
6	130	439
7	119	426
8	123	440
9	100	426
10	100	439

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X=1095(M)
Z= 432(M)
R= 334(M)
SLOPE=0.23

AVERAGED METEOROLOGICAL CONDITIONS

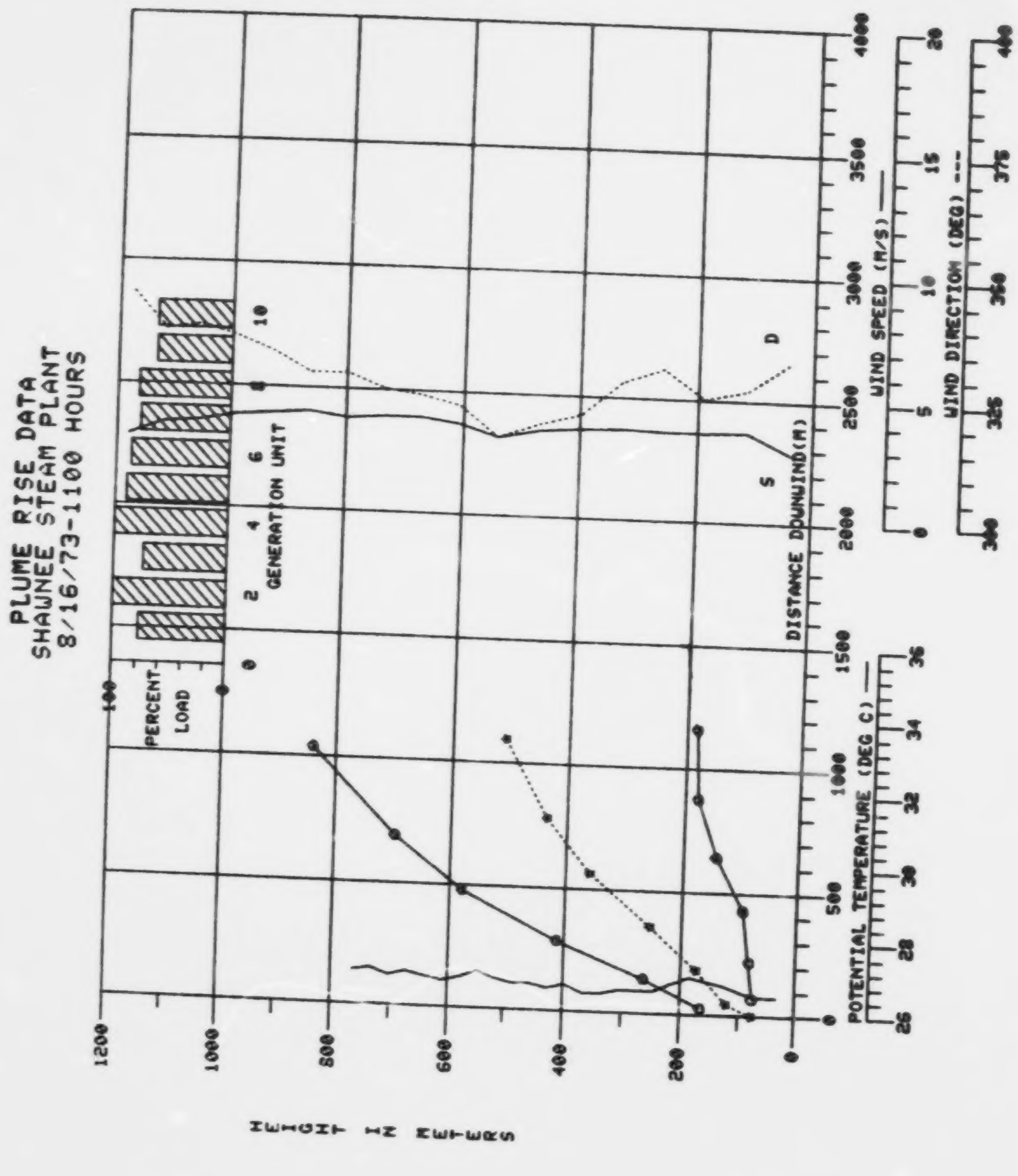
UNIT	1-4
UBAR (M/S)	3.6
DIR (DEG)	324
DT/DZ(C/100M)	0.05
UAO (M/S)	4.5
TAO (K)	299

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.0	-0.2

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	433
VO (M/S)	14.0
FM (M4/S2)	584
FH (M4/S3)	183
LM (M)	6.6
LB (M)	3.8
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
8/16/73-1100 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
POTENTIAL TEMPERATURE (DEG C)
WIND SPEED (M/S)
WIND DIRECTION (DEG)

OBSERVED PLUME RISE AND ATMOSPHERIC DATA

SHAWNEE STEAM PLANT 8/16/73-1200 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 1145 - 1219 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
96	-2	26	80	61	39	55
169	33	38	170	103	101	94
262	67	123	266	192	166	121
387	96	236	387	311	241	164
551	126	383	503	467	314	206
756	165	551	616	653	390	246
1029	207	814	750	921	478	291

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5

CS#= 7 BETA= 0 DIR=345

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 1200 - POTENTIAL TEMP (C)	AIRCRAFT - 1200 - GRAD (DC/100M)	PIBALS 1145&1200 SPEED (WIND TO) (M/S)	PIBALS 1145&1200 DIR (DEG)
50	27.3	0.0	2.4	306
100	27.2	-0.4	2.6	306
150	27.2	0.2	2.5	307
200	27.2	0.1	2.4	309
250	27.3	0.1	2.5	312
300	27.2	-0.3	2.7	314
350	27.2	0.1	2.8	317
400	27.2	0.0	2.9	322
450	27.2	0.0	3.0	322
500	27.2	0.2	3.0	320
550	27.3	0.0	3.1	319
600	27.3	-0.1	3.1	322
650	27.2	0.1	3.0	321
700	27.2	-0.0	2.8	320
750	27.3	0.2	2.7	319
800	27.5	0.1	2.8	320
850	27.6	-0.0	3.0	327
900			3.2	333
950			3.1	334
1000			2.9	333
1050			2.6	336
1100			2.6	342
TOWER		-0.2	1.3	360

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	115	444
2	151	444
3	114	442
4	152	443
5	133	442
6	130	440
7	119	433
8	124	441
9	100	426
10	100	437

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X= 921(M)
Z= 478(M)
R= 291(M)
SLOPE=0.33

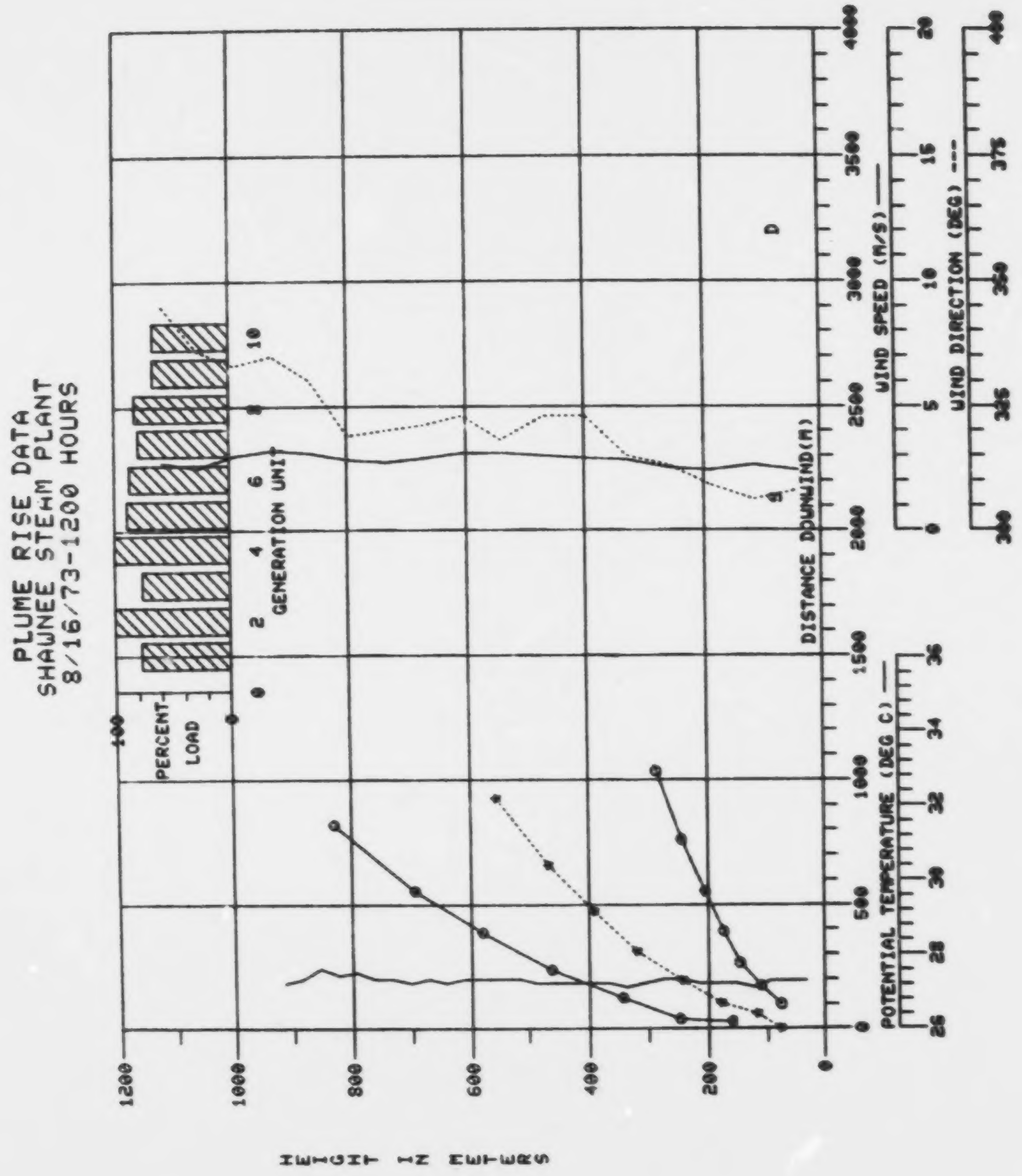
AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	2.8
DIR (DEG)	317
DT/DZ(C/100M)	0.02
UAS (M/S)	2.6
TAU (K)	300

WIND SHEAR SPEED (M/S/100M)	WIND SHEAR DIRECTION (DEG/100M)
0.1	2.2

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	434
VO (M/S)	14.0
FM (M4/S2)	587
FH (M4/S3)	183
LM (M)	8.7
LB (M)	8.4
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
8/16/73-1200 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
POTENTIAL TEMPERATURE (DEG C)
WIND SPEED (M/S)
WIND DIRECTION (DEG)
HEIGHT IN METERS

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 10/23/74- 820 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 811 - 829 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
80	-3	55	60	67	28	33
160	4	155	88	157	46	41
300	12	298	86	299	49	37
530	18	528	100	529	59	41
858	11	856	126	857	68	57
1228	39	1224	150	1226	94	55
1582	33	1582	155	1582	94	61
1908	61	1908	144	1908	102	41
2219	63	2220	133	2219	98	35

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 3 BETA= 5 DIR= 75

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 800 - POTENTIAL TEMP (C)	AIRCRAFT - 800 - POTENTIAL GRAD (DC/100M)	PIBALS 830& 845 SPEED (M/S)	PIBALS 830& 845 DIR (WIND TO) (DEG)
50	13.1	4.5	4.7	36
100	15.1	3.9	7.7	52
150	16.6	2.0	8.7	58
200	17.4	1.2	8.9	61
250	18.0	1.3	9.1	64
300	18.6	0.6	9.0	69
350	18.8	0.7	9.0	72
400	19.1	0.7	9.0	75
450	19.4	0.5	8.9	79
500	19.7	0.7	8.8	83
550	20.0	0.5	8.7	87
600	20.3	0.8	8.6	93
650	20.8	1.8	8.2	101
700	22.0	2.0	7.6	109
750	22.6	0.9	7.0	117
800	23.1	0.8	7.0	125
850	23.3	0.3	6.8	135

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	158	444
2	160	432
3	164	431
4	162	430
5	163	432
6	157	433
7	147	429
8	166	422
9	166	428
10	146	423

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X=2219(M)
Z= 98(M)
R= 35(M)
SLOPE=0.0

AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	8.4
DIR (DEG)	57
DT/DZ(C/100M)	2.49
UAO (M/S)	7.9
TAO (K)	287

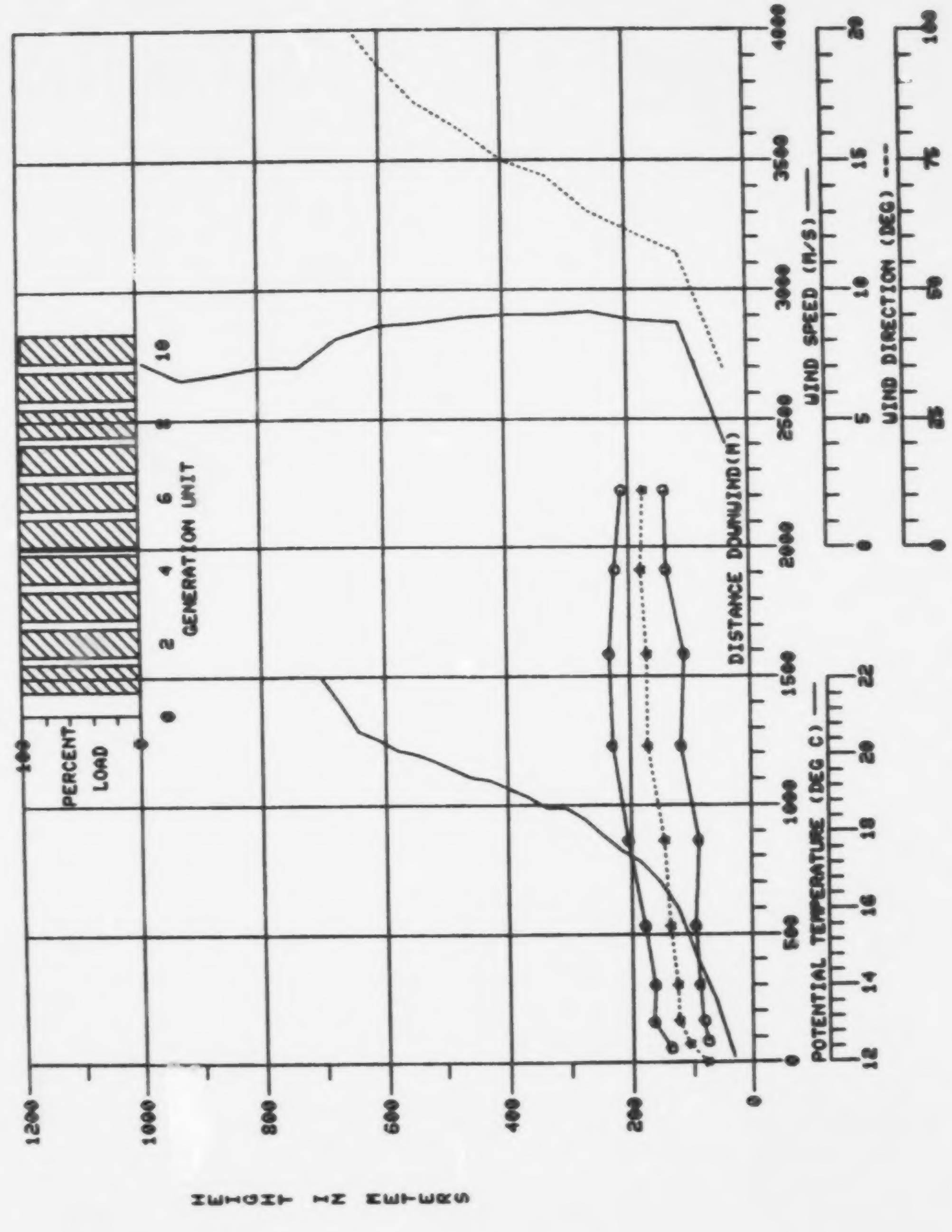
WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.3	5.6

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	425
VO (M/S)	17.1
FM (M4/S2)	851
FB (M4/S3)	235
LM (M)	3.5
LB (M)	0.4
NO.STACKS	10

PLUME RISE DATA
SHAWNEE STEAM PLANT
10/23/74- 820 HOURS



OBSERVED PLUME RISE AND ATMOSPHERIC DATA

SHAWNEE STEAM PLANT 10/23/74- 910 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 901 - 919 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	CENTER R (M)
69	4	61	63	65	33	28
135	11	130	83	132	47	35
211	13	209	99	210	56	42
308	13	307	119	307	66	52
432	19	431	145	431	82	62
571	16	571	158	571	87	71
770	-14	794	171	782	78	92
LR	LR	1252	180	----	---	---
LR	LR	1678	175	----	---	---
LR	LR	2071	199	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 3 BETA= A DIR= 80

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 930 - POTENTIAL TEMP (C)	GRAD (DC/100M)	PIBALS 930& 940 SPEED (M/S)	DIR (WIND TO) (DEG)
50	13.8	0.4	3.7	50
100	14.3	2.4	3.9	53
150	15.9	3.0	4.6	57
200	17.1	1.8	6.3	61
250	17.9	1.8	9.4	63
300	18.7	0.9	11.2	73
350	19.1	0.8	11.6	80
400	19.3	0.5	10.9	78
450	19.8	1.2	10.5	80
500	20.3	0.8	10.5	82
550	20.7	0.8	10.5	86
600	21.1	1.3	10.2	92
650	22.0	1.7	9.8	96
700	22.7	1.2	9.1	101
750	23.1	0.4	8.1	107
800	23.3	0.5	7.4	118
850	23.3	0.2	8.4	146

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	155	446
2	161	436
3	165	431
4	163	431
5	167	434
6	165	435
7	138	424
8	165	423
9	166	428
10	147	424

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X= 782(M)
Z= 78(M)
R= 92(M)
SLOPE=0.0

AVERAGED METEOROLOGICAL CONDITIONS

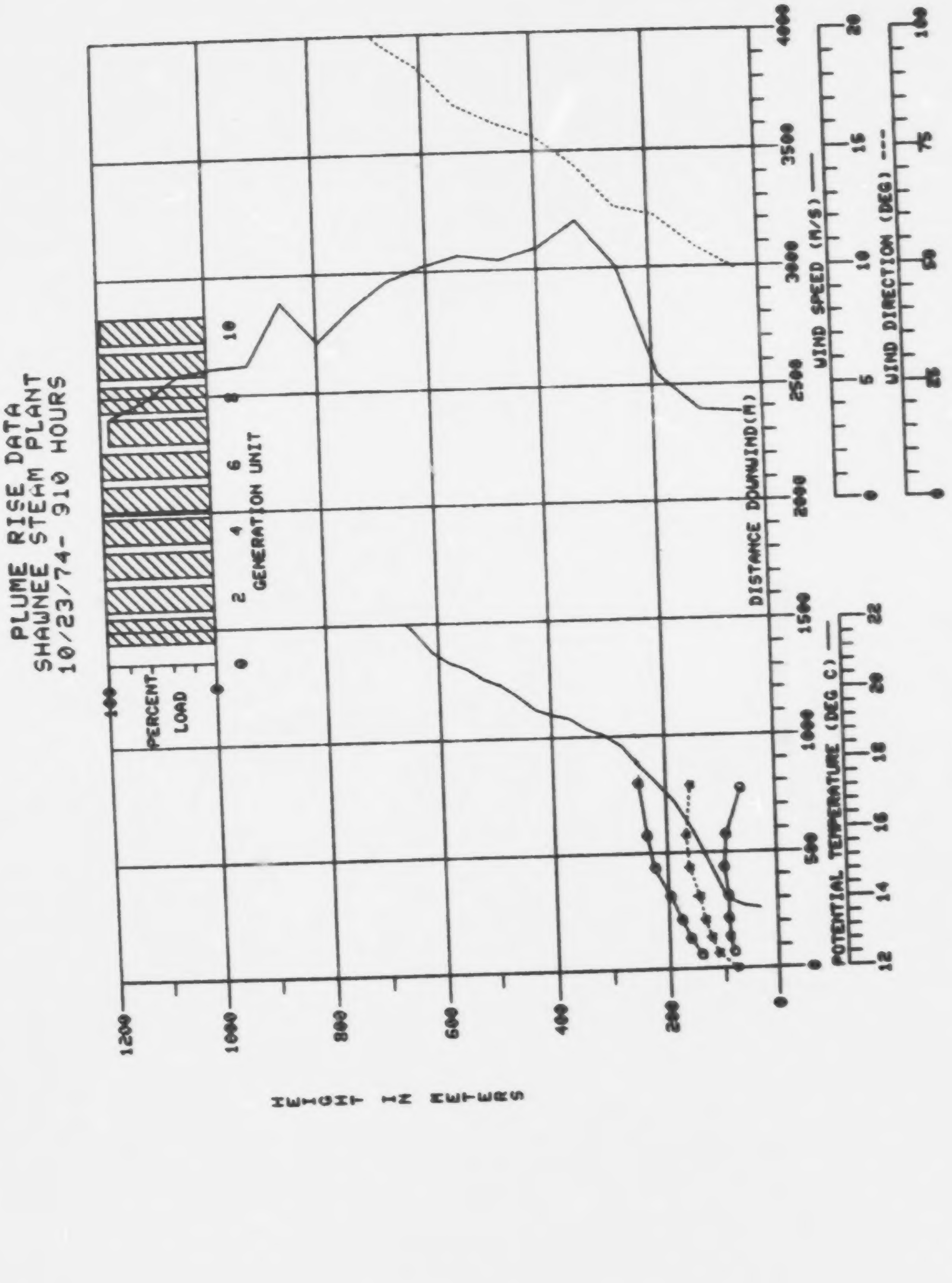
UNIT	1-4
UBAR (M/S)	5.4
DIR (DEG)	58
DT/DZ(C/100M)	2.32
UAO (M/S)	3.9
TAO (K)	286

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
4.2	6.3

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	426
VO (M/S)	17.2
FM (M4/S2)	855
FB (M4/S3)	239
LM (M)	5.4
LB (M)	1.5
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
10/23/74- 910 HOURS
PERCENT LOAD
100
0
0 2 4 6 8 10
GENERATION UNIT
DISTANCE DOWNWIND(M)
0 500 1000 1500 2000 2500 3000 3500 4000
WIND SPEED (M/S) ——
0 5 10 15 20
WIND DIRECTION (DEG) ---
0 25 50 75 100
POTENTIAL TEMPERATURE (DEG C) ——
12 14 16 18 20 22
0 200 400 600 800 1000 1200
HEIGHT IN METERS

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 10/23/74-1005 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 1001 - 1013 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	CENTER R (M)
75	8	21	106	48	57	55
161	14	143	174	152	94	82
253	-8	296	242	274	117	123
LR	LR	734	340	----	---	---
LR	LR	1333	339	----	---	---
LR	LR	1950	294	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 3 BETA= 8 DIR= 80

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 930 - POTENTIAL TEMP (C)	AIRCRAFT - 930 - GRAD (DC/100M)	PIBALS 1030&1050 SPEED (M/S)	PIBALS 1030&1050 DIR (WIND TO) (DEG)
50	13.8	0.4	3.3	49
100	14.3	2.4	3.5	62
150	15.9	3.0	3.9	69
200	17.1	1.8	4.7	73
250	17.9	1.8	5.9	74
300	18.7	0.9	6.9	77
350	19.1	0.8	7.7	83
400	19.3	0.5	8.0	92
450	19.8	1.2	7.4	100
500	20.3	0.8	7.4	105
550	20.7	0.8	7.3	111
600	21.1	1.3	6.0	122
650	22.0	1.7	5.5	135
700	22.7	1.2	4.9	148
750	23.1	0.4	4.7	161
800	23.3	0.5	5.5	171
850	23.3	0.2	4.5	172

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	156	443
2	150	438
3	156	435
4	154	428
5	157	439
6	155	435
7	133	427
8	160	422
9	158	430
10	149	425

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X= 274(M)
Z= 117(M)
R= 123(M)
SLOPE=0.19

AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	4.9
DIR (DEG)	71
DT/DZ(C/100M)	2.02
UA0 (M/S)	3.5
TA0 (K)	286

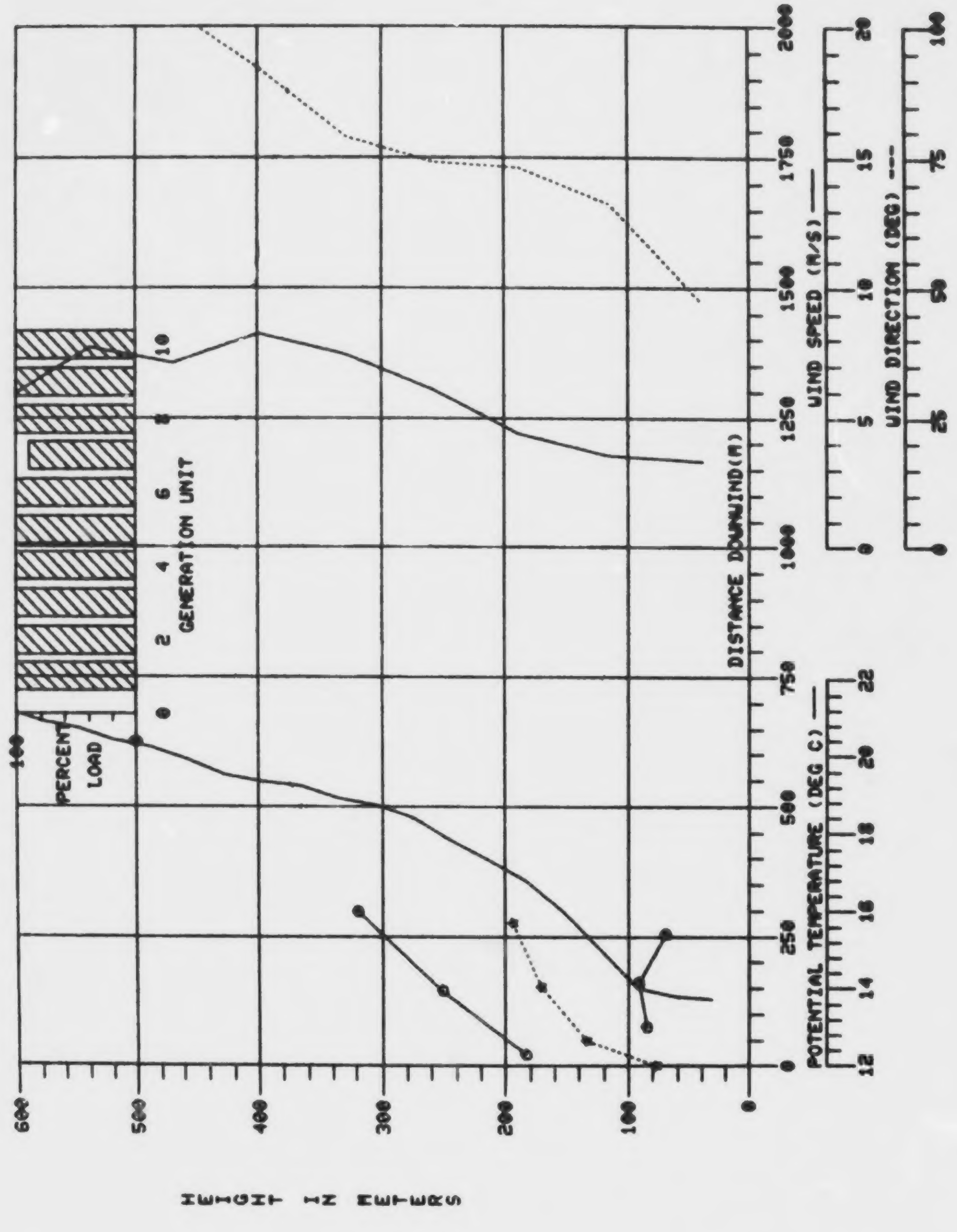
WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
1.9	5.6

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	426
VO (M/S)	16.5
FM (M4/S2)	793
FB (M4/S3)	230
LM (M)	5.7
LB (M)	1.9
NO.STACKS	10

PLUME RISE DATA
SHAWNEE STEAM PLANT
10/23/74-1005 HOURS



OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 10/23/74-1210 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 1201 - 1219 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
76	3	42	71	59	37	37
155	13	113	140	134	76	68
245	-2	193	215	219	106	111
LR	LR	568	563	----	---	---
LR	LR	1139	693	----	---	---
LR	LR	1935	614	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 3 BETA= 3 DIR= 80

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT 1100 & 1122 POTENTIAL TEMP (C)	AIRCRAFT GRAD (DC/100M)	PIBALS 1230&1240 SPEED (M/S)	PIBALS DIR (WIND TO) (DEG)
50	19.4	-0.2	3.6	142
100	19.5	0.2	4.2	147
150	19.5	0.2	3.9	147
200	19.6	-0.2	3.1	146
250	19.3	0.0	2.5	146
300	19.8	0.9	2.0	147
350	20.1	1.0	2.0	148
400	20.9	1.2	2.4	146
450	21.3	1.4	2.4	128
500	22.0	1.1	2.9	135
550	22.7	1.5	3.3	153
600	23.1	0.6	2.9	160
650	23.3	0.3	2.6	162
700	23.4	0.2	2.2	160
750	23.6	0.4	1.9	156
800	23.8	0.3	2.0	153
850	24.0	0.4	1.9	151

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	144	444
2	150	435
3	151	434
4	143	430
5	137	434
6	152	438
7	145	428
8	155	424
9	153	432
10	143	429

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X= 219(M)
Z= 106(M)
R= 111(M)
SLOPF=0.35

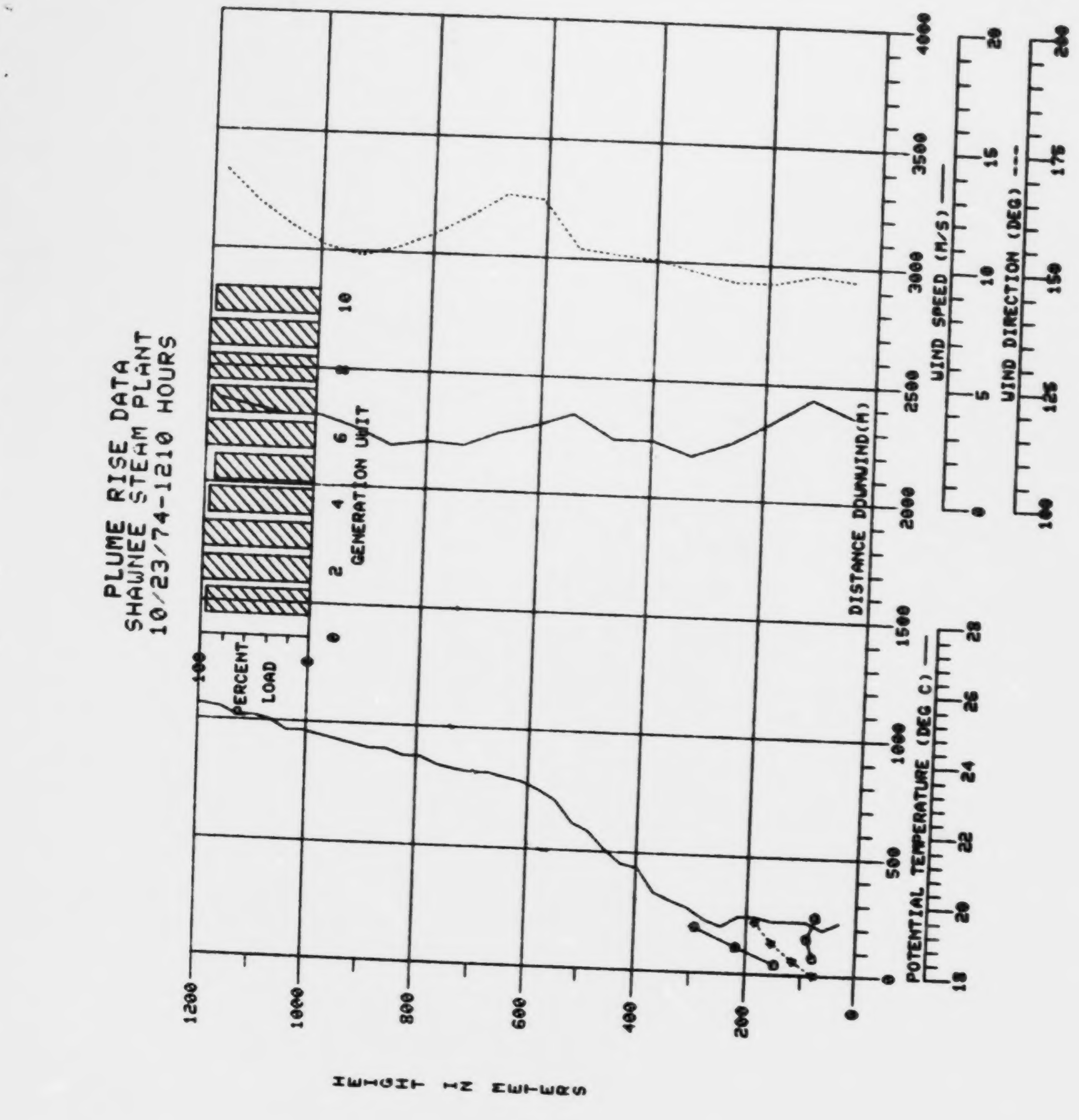
AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	3.3
DIR (DEG)	147
DT/DZ(C/100M)	0.13
UA0 (M/S)	4.2
TA0 (K)	292

WIND SHEAR SPEED (M/S/100M)	WIND SHEAR DIRECTION (DEG/100M)
-1.2	-0.0

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	427
VO (M/S)	16.0
FM (M4/S2)	753
FB (M4/S3)	214
LM (M)	8.2
LB (M)	5.8
NO.STACKS	10


PLUME RISE DATA
SHAWNEE STEAM PLANT
10/23/74-1210 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
WIND SPEED (M/S)
WIND DIRECTION (DEG)
POTENTIAL TEMPERATURE (DEG C)
HEIGHT IN METERS

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 10/23/74-1300 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 1301 - 1307 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
80	3	37	61	58	32	35
191	30	127	146	159	88	66
314	-12	256	299	285	143	161

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 3 BETA= -2 DIR= 80

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT 1340 & 1350 POTENTIAL TEMP (C)	AIRCRAFT GRAD (DC/100M)	PIBALS 1330&1340 SPEED (M/S)	PIBALS DIR (WIND TO) (DEG)
50	23.2	0.0	3.3	40
100	23.1	-0.4	3.3	41
150	23.1	0.2	3.3	43
200	23.1	0.0	3.1	46
250	23.1	0.2	2.6	50
300	23.2	0.0	3.0	54
350	23.2	0.1	3.2	57
400	23.3	-0.0	2.7	60
450	23.2	-0.0	1.8	62
500	23.2	0.0	1.6	64
550	23.2	0.3	1.8	65
600	23.3	0.1	2.2	65
650	23.5	-0.0		
700	23.3	-0.2		
750	23.4	0.8		
800	24.0	0.4		
850	24.3	0.3		

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	155	451
2	151	435
3	151	435
4	148	429
5	149	434
6	152	436
7	147	429
8	155	424
9	153	431
10	147	428

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X= 285(M)
Z= 143(M)
R= 161(M)
SLOPE=0.44

AVERAGED METEOROLOGICAL CONDITIONS

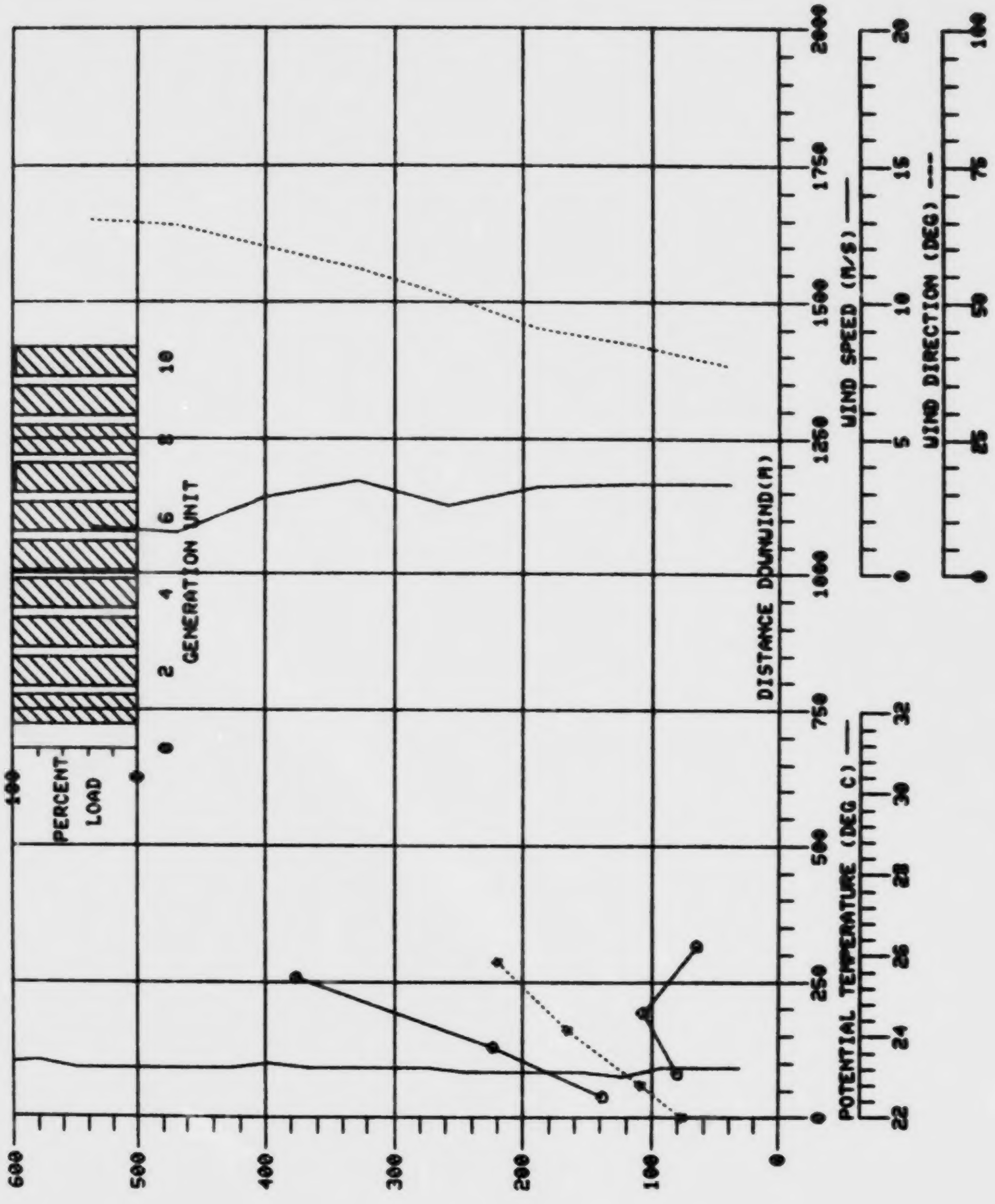
UNIT	1-4
UBAR (M/S)	3.1
DIR (DEG)	49
DT/DZ(C/100M)	0.01
UA0 (M/S)	3.3
TA0 (K)	296

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
-0.1	6.6

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	427
V0 (M/S)	16.3
FM (M4/S2)	799
FB (M4/S3)	212
LM (M)	9.2
LB (M)	7.2
NO.STACKS	10



PLUME RISE DATA
SHAWNEE STEAM PLANT
10/23/74-1300 HOURS

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 10/24/74- 825 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 816 - 834 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
73	4	45	41	59	22	21
165	31	131	90	148	60	33
317	67	271	188	294	127	64
513	86	483	272	498	179	94
755	72	749	286	752	179	106
988	47	990	256	989	151	104
1257	42	1262	263	1259	152	110
1467	39	1473	259	1470	149	110

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 3 BETA= 16 DIR= 90

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT 902 & 915 POTENTIAL TEMP (C)	AIRCRAFT 902 & 915 POTENTIAL GRAD (DC/100M)	PIBALS 830& 840 SPEED (M/S)	PIBALS 830& 840 DIR (WIND TO) (DEG)
50	17.3	1.8	3.1	33
100	19.0	4.7	3.6	69
150	20.7	1.3	4.4	79
200	21.2	1.3	5.4	80
250	21.8	0.9	6.4	81
300	22.2	0.5	6.4	83
350	22.3	0.1	6.1	84
400	22.4	0.1	5.7	84
450	22.5	0.3	5.7	82
500	22.7	0.5	5.6	79
550	22.9	0.3	5.5	75
600	23.1	0.1	5.4	67
650	23.0	-0.1	5.3	61
700	23.0	0.2	5.0	57
750	23.2	0.2	4.5	55
800	23.2	0.3	3.9	55
850	23.2	-0.0	3.6	54

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	155	445
2	149	432
3	121	0
4	141	426
5	147	436
6	149	437
7	148	430
8	150	417
9	150	433
10	---	---

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X=1470(M)
Z= 149(M)
R= 110(M)
SLOPE=0.0

AVERAGED METEOROLOGICAL CONDITIONS

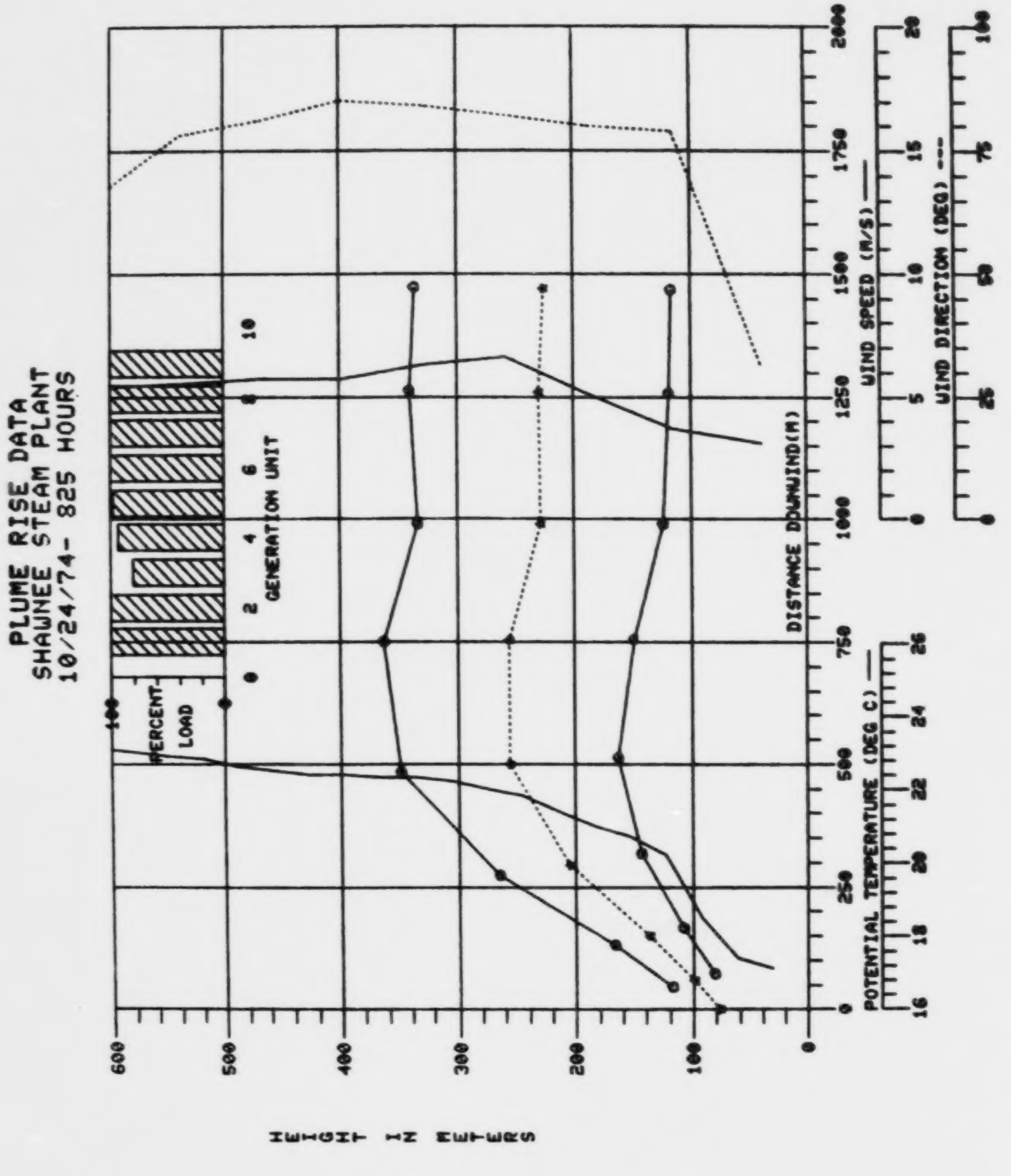
UNIT	1-4
UBAR (M/S)	5.3
DIR (DEG)	79
DT/DZ(C/100M)	1.68
UA0 (M/S)	3.7
TA0 (K)	290

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.7	2.3

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	426
VO (M/S)	16.1
FM (M4/S2)	759
FB (M4/S3)	217
LM (M)	5.2
LB (M)	1.5
NO.STACKS	8


PLUME RISE DATA
SHAWNEE STEAM PLANT
10/24/74- 825 HOURS
100
PERCENT LOAD
0
0 2 4 6 8 10
GENERATION UNIT
DISTANCE DOWNWIND(M)
0 250 500 750 1000 1250 1500 1750 2000
600 500 400 300 200 100 0
POTENTIAL TEMPERATURE (DEG C)
16 18 20 22 24 26
WIND SPEED (M/S)
0 5 10 15 20
WIND DIRECTION (DEG)
0 25 50 75 100

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 10/24/74-1005 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 1000 - 1014 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
69	20	44	43	56	31	22
83	78	27	132	55	105	54
155	113	60	245	107	179	63
255	137	211	329	233	233	96
385	189	368	362	376	275	87
581	213	574	399	577	306	94
841	156	837	372	839	264	107
1163	189	1165	394	1164	291	102
1459	190	1454	392	1456	291	101
1692	193	1697	405	1694	299	105

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 3 BETA= -4 DIR= 85

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT 902 & 915 POTENTIAL TEMP (C)	AIRCRAFT 902 & 915 GRAD (DC/100M)	PIBALS 1000&1010 SPEED (M/S)	PIBALS 1000&1010 DIR (WIND TO) (DEG)
50	17.3	-1.8	1.9	66
100	19.0	4.7	2.3	66
150	20.7	1.3	3.2	63
200	21.2	1.3	4.0	60
250	21.8	0.9	4.1	57
300	22.2	0.5	4.1	53
350	22.3	0.1	4.3	51
400	22.4	0.1	4.6	52
450	22.5	0.3	4.7	52
500	22.7	0.5	4.8	48
550	22.9	0.3	4.9	46
600	23.1	0.1	4.8	51
650	23.0	-0.1	5.1	50
700	23.0	0.2	4.8	49
750	23.2	0.2	4.3	45
800	23.2	0.3	4.2	34
850	23.2	-0.0	3.9	36

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	154	443
2	148	434
3	126	430
4	141	430
5	150	436
6	134	432
7	141	426
8	155	424
9	152	434
10	---	---

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X=1694(M)
Z= 299(M)
R= 105(M)
SLOPE=0.03

AVERAGED METEOROLOGICAL CONDITIONS

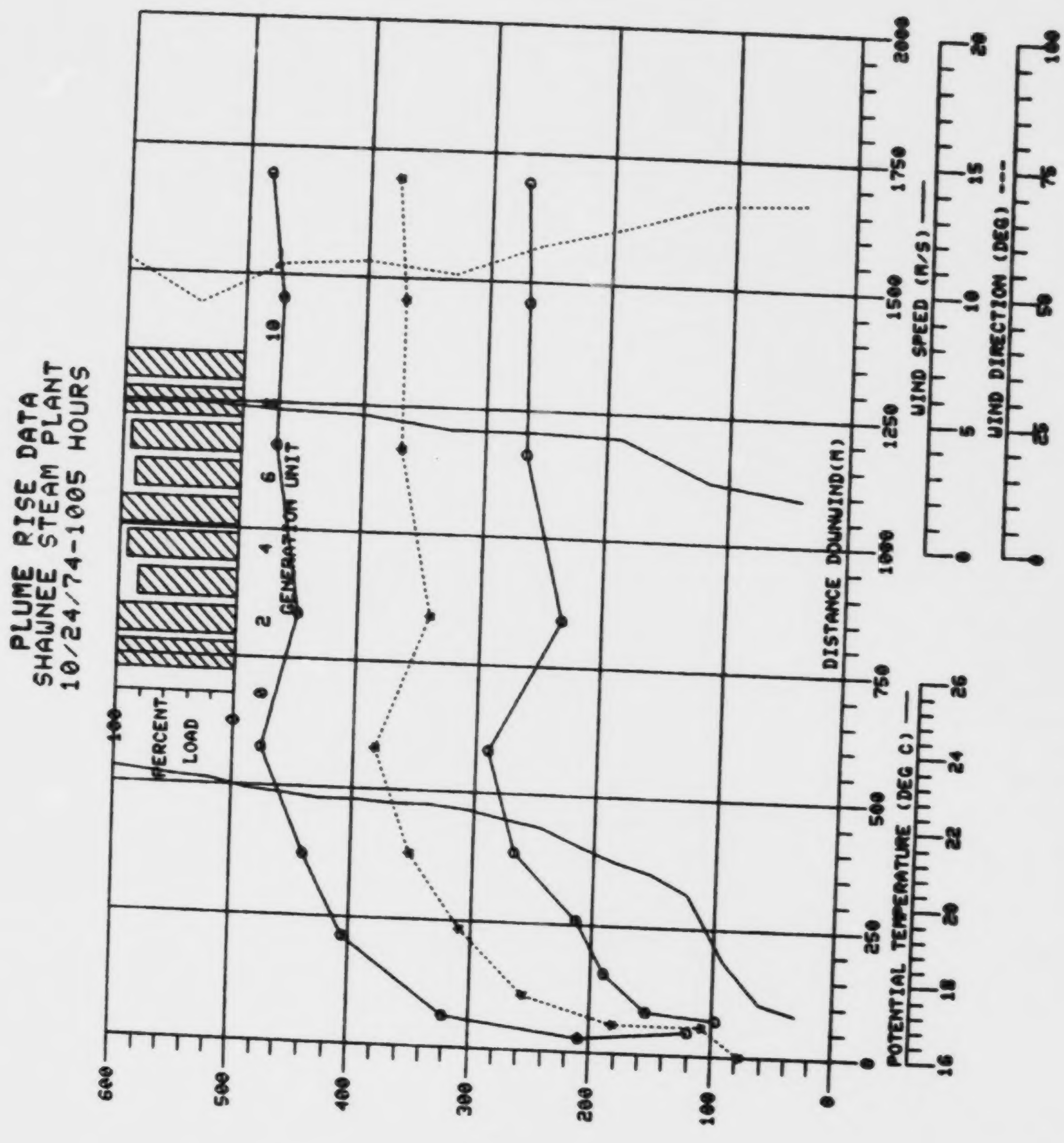
UNIT	1-4
UBAR (M/S)	3.9
DIR (DEG)	57
DT/DZ(C/100M)	1.14
UAD (M/S)	2.4
TAO (K)	290

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.5	-4.5

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	426
VO (M/S)	15.7
FM (M4/S2)	726
FB (M4/S3)	212
LM (M)	6.9
LB (M)	3.5
NO.STACKS	9


PLUME RISE DATA
SHAWNEE STEAM PLANT
10/24/74-1005 HOURS
HEIGHT IN METERS
DISTANCE DOWNWIND(M)
PERCENT LOAD
GENERATION UNIT
POTENTIAL TEMPERATURE (DEG C)
WIND SPEED (M/S)
WIND DIRECTION (DEG)

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 10/24/74-1110 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 1101 - 1119 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
63	10	5	120	34	65	62
158	47	100	224	129	135	97
278	41	241	296	259	168	127
442	69	414	336	428	202	133
687	98	663	416	675	257	158
938	113	948	442	943	277	164
1278	111	1286	457	1282	284	173
1655	73	1669	449	1662	261	168

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 3 BETA= -9 DIR= 68

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT 1105 & 1120 POTENTIAL TEMP (C)	AIRCRAFT GRAD (DC/100M)	PIBALS 1100&1112 SPEED (M/S)	PIBALS DIR (WIND TO) (DEG)
50	20.4	-0.0	2.2	56
100	20.6	0.5	2.2	55
150	21.1	0.9	2.2	54
200	21.4	0.9	2.3	52
250	21.8	0.8	2.6	49
300	22.2	0.7	3.2	46
350	22.3	-0.0	3.7	42
400	22.6	0.9	4.0	38
450	22.7	0.2	4.6	35
500	23.0	0.5	4.7	33
550	23.1	0.2	4.6	32
600	23.2	0.2	4.6	33
650	23.4	0.2	4.0	35
700	23.5	0.0	3.9	36
750	23.5	0.3	3.9	38
800	23.7	0.4	3.7	39
850	23.8	0.3	3.7	42

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	153	442
2	151	434
3	130	0
4	149	431
5	153	438
6	117	436
7	150	427
8	155	424
9	153	434
10	---	---

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X=1662(M)
Z= 261(M)
R= 188(M)
SLOPE=0.0

AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	3.3
DIR (DEG)	45
DT/DZ(C/100M)	0.58
UA0 (M/S)	2.2
TA0 (K)	293

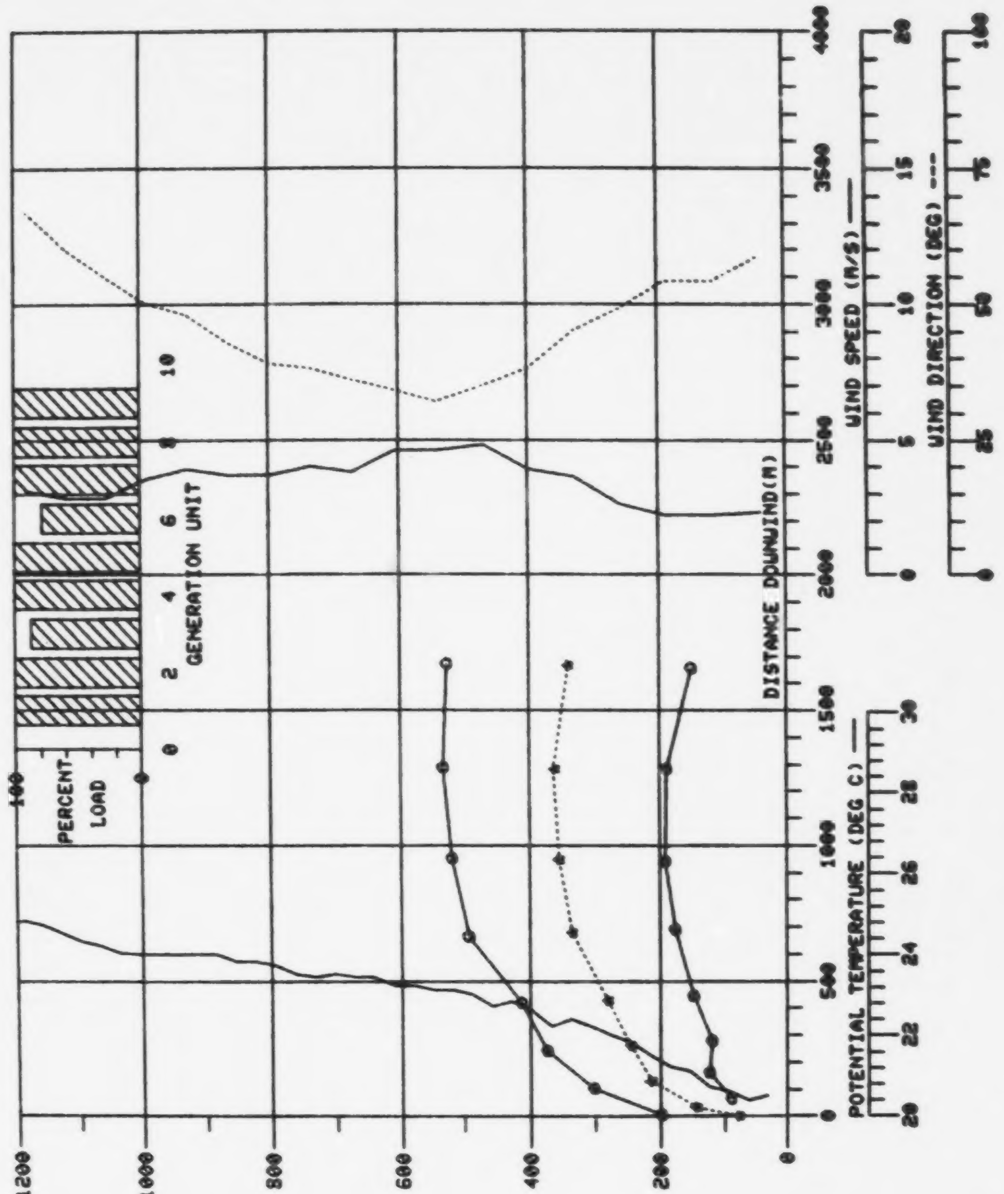
WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.7	-5.8

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	427
VO (M/S)	16.1
FM (M4/S2)	767
FH (M4/S3)	214
LM (M)	8.5
LH (M)	6.1
NO.STACKS	8

PLUME RISE DATA
SHAWNEE STEAM PLANT
10/24/74-1110 HOURS



OBSERVED PLUME RISE AND ATMOSPHERIC DATA

SHAWNEE STEAM PLANT 10/25/74- 810 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 801 - 819 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
70	1	62	67	66	34	30
257	31	241	128	249	79	49
511	41	504	186	507	113	72
794	50	796	217	795	133	63
1195	39	1191	227	1193	133	43
1522	40	1523	214	1522	127	67
1884	40	1885	225	1884	132	92
2252	50	2259	209	2255	129	79

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5

CS#= 3 BETA= 6 DIR= 66

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT 722 & 730 POTENTIAL TEMP (C)	AIRCRAFT 722 & 730 POTENTIAL GRAD (DC/100M)	PIBALS 800& 815 SPEED (WIND TO) (M/S)	PIBALS 800& 815 DIR (WIND TO) (DEG)
50	16.7	4.7	4.1	19
100	19.2	4.0	6.2	54
150	20.6	2.2	7.5	70
200	21.4	1.2	8.2	77
250	21.8	0.5	8.3	80
300	22.2	0.9	8.1	80
350	22.5	0.6	7.8	80
400	22.7	0.5	7.6	82
450	23.0	0.5	7.6	85
500	23.2	0.4	7.5	84
550	23.3	0.0	7.2	80
600	23.4	0.3	6.7	74
650	23.6	0.5	6.3	75
700	23.8	0.3	5.7	77
750	24.0	0.5	5.4	80
800	24.2	0.1	5.7	80
850	24.2	-0.1	5.3	78
TOWER	15.0	6.4	LR	LR

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	152	448
2	151	430
3	---	---
4	149	429
5	150	435
6	153	434
7	150	426
8	151	422
9	118	424
10	128	424

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X=2255(M)
Z= 129(M)
R= 79(M)
SLOPE=0.0

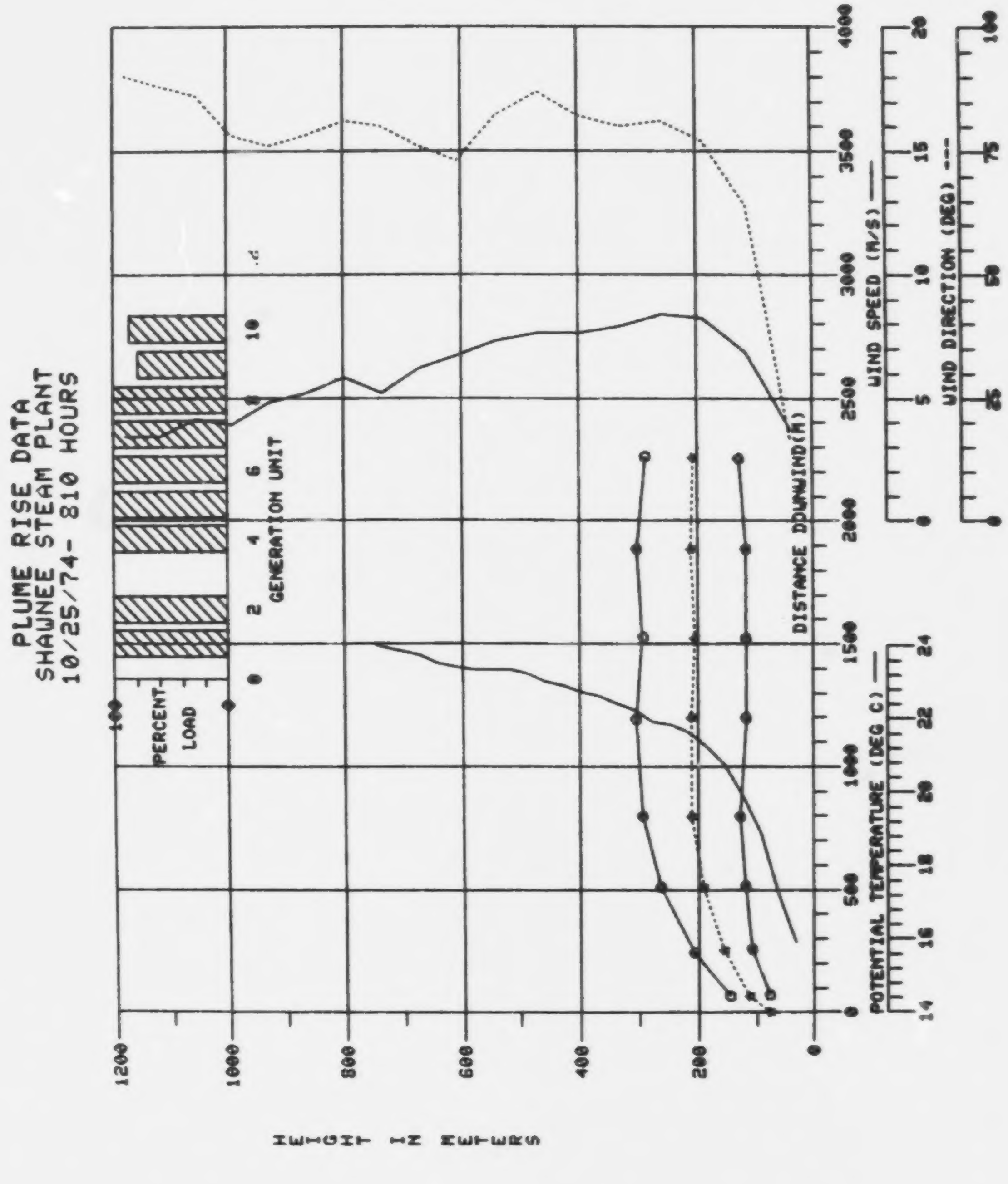
AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	7.6
DIR (DEG)	71
DT/DZ(C/100M)	1.90
UAD (M/S)	6.3
TAD (K)	291

WIND SHEAR SPEED (M/S/100M)	WIND SHEAR DIRECTION (DEG/100M)
0.5	7.4

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	425
VO (M/S)	15.7
FM (M4/S2)	729
FH (M4/S3)	209
LM (M)	3.6
LH (M)	0.5
NO.STACKS	9


PLUME RISE DATA
SHAWNEE STEAM PLANT
10/25/74- 810 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
WIND SPEED (M/S)
WIND DIRECTION (DEG)
POTENTIAL TEMPERATURE (DEG C)

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 10/25/74- 910 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 901 - 919 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
66	3	61	46	63	24	20
190	21	189	88	189	54	32
377	32	376	135	376	83	50
578	43	580	155	579	99	55
854	42	853	175	853	108	66
1157	26	1156	184	1156	105	78
1472	40	1472	196	1472	118	77
1957	71	1966	212	1961	141	70

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 3 BETA= -4 DIR= 90

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT 900 & 915 POTENTIAL TEMP (C)	AIRCRAFT 900 & 915 GRAD (DC/100M)	PIBALS 900& 917 SPEED (M/S)	PIBALS 900& 917 DIR (WIND TO) (DEG)
50	18.9	3.2	4.1	34
100	20.4	2.3	6.5	50
150	21.4	2.1	7.3	62
200	22.4	1.9	7.3	67
250	23.2	1.1	7.1	71
300	23.6	0.5	7.0	76
350	23.7	0.1	7.0	80
400	23.7	0.2	7.1	83
450	24.0	0.4	7.0	83
500	24.1	0.4	6.9	82
550	24.2	0.0	6.5	80
600	24.3	0.3	5.7	80
650	24.4	0.1	6.1	81
700	24.3	-0.2	6.0	81
750	24.4	0.3	5.6	81
800	24.6	0.5	5.4	81
850	24.7	0.1	5.1	76
TOWER	21.2	11.8	LR	LR

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	149	445
2	150	433
3	---	---
4	150	430
5	148	436
6	150	431
7	155	427
8	153	422
9	119	424
10	135	426

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X=1961(M)
Z= 141(M)
R= 70(M)
SLOPE=0.05

AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	7.1
DIR (DEG)	64
DT/DZ(C/100M)	1.77
UAO (M/S)	6.6
TAO (K)	292

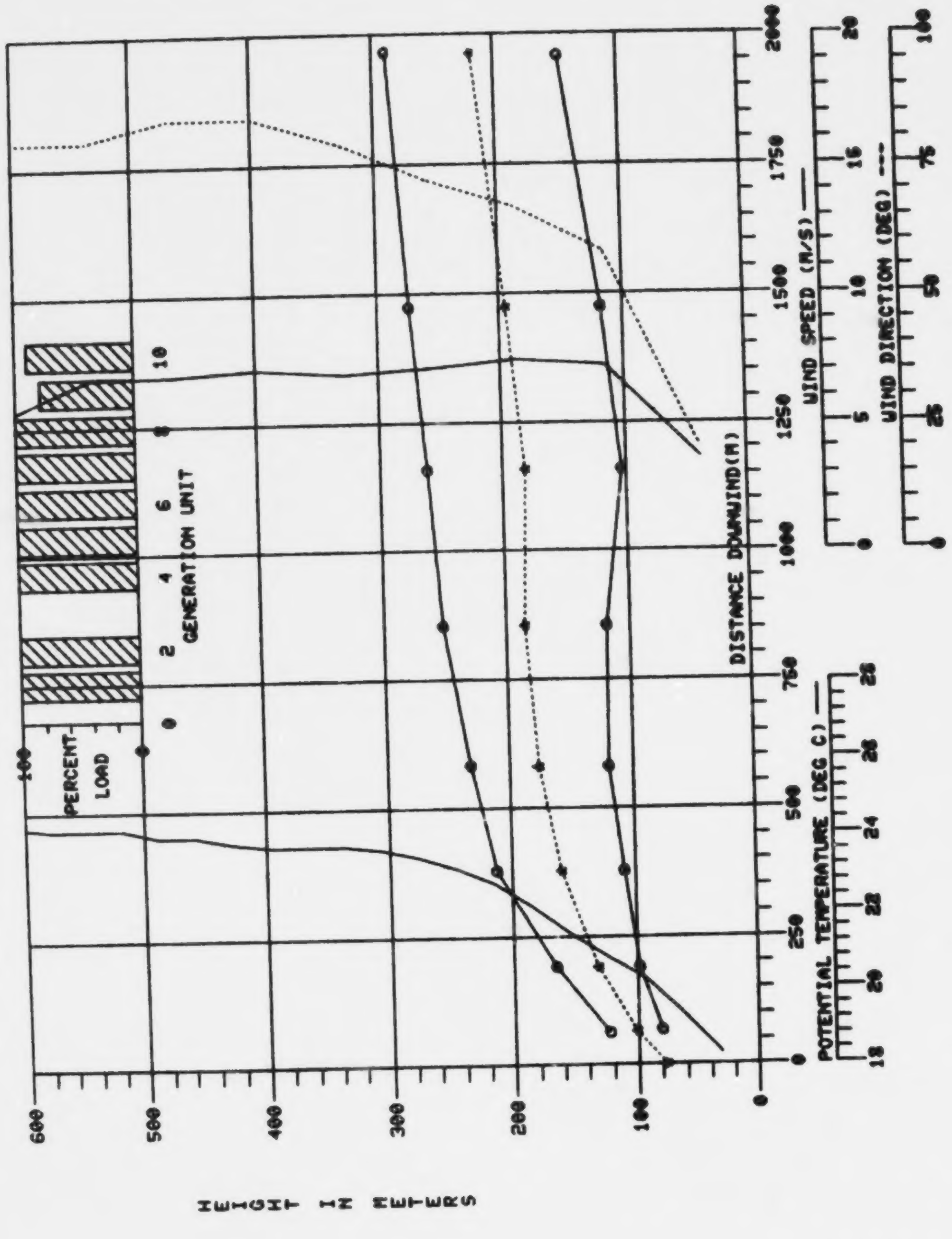
WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
-0.2	9.6

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	425
VO (M/S)	15.8
FM (M4/S2)	737
FB (M4/S3)	209
LM (M)	3.8
LB (M)	0.6
NO.STACKS	9

PLUME RISE DATA
SHAWNEE STEAM PLANT
10/25/74- 910 HOURS



OBSERVED PLUME RISE AND ATMOSPHERIC DATA

SHAWNEE STEAM PLANT 10/25/74-1010 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 1001 - 1019 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
68	0	42	106	55	53	54
229	35	188	200	208	117	84
424	69	386	304	405	186	119
661	64	657	340	659	202	138
942	29	947	359	944	194	164
1201	33	1200	335	1200	184	151
1427	35	1432	326	1429	180	145
1633	41	1644	330	1638	185	144

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5

CS#= 3 BETA= 1 DIR= 90

TEMPERATURE AND WIND PROFILES

ELEV (M)	AIRCRAFT - 915 - POTENTIAL TEMP (C)	AIRCRAFT - 915 - GRAD (DC/100M)	PIBALS 1000&1016 SPEED (WIND TO) (M/S)	PIBALS 1000&1016 DIR (WIND TO) (DEG)
50	18.6	7.2	2.9	42
100	21.3	2.3	3.9	50
150	21.8	1.9	5.2	63
200	23.1	2.2	6.3	76
250	23.7	0.8	6.3	81
300	24.0	0.1	6.2	83
350	23.9	-0.1	6.2	83
400	23.9	0.4	6.1	84
450	24.1	0.3	6.1	86
500	24.3	0.4	6.2	86
550	24.4	0.3	6.2	86
600	24.4	-0.2	5.5	86
650	24.5	-0.3	5.6	87
700	24.3	0.2	5.6	85
750	24.5	0.5	5.3	82
800	24.7	0.3	5.0	83
850	24.8	0.0	4.7	93
TOWER	19.2	-0.6	LR	LR

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	149	441
2	149	434
3	---	---
4	150	429
5	147	438
6	151	435
7	155	431
8	153	422
9	118	429
10	142	428

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X=1638(M)
Z= 185(M)
R= 144(M)
SLOPE=0.02

AVERAGED METEOROLOGICAL CONDITIONS

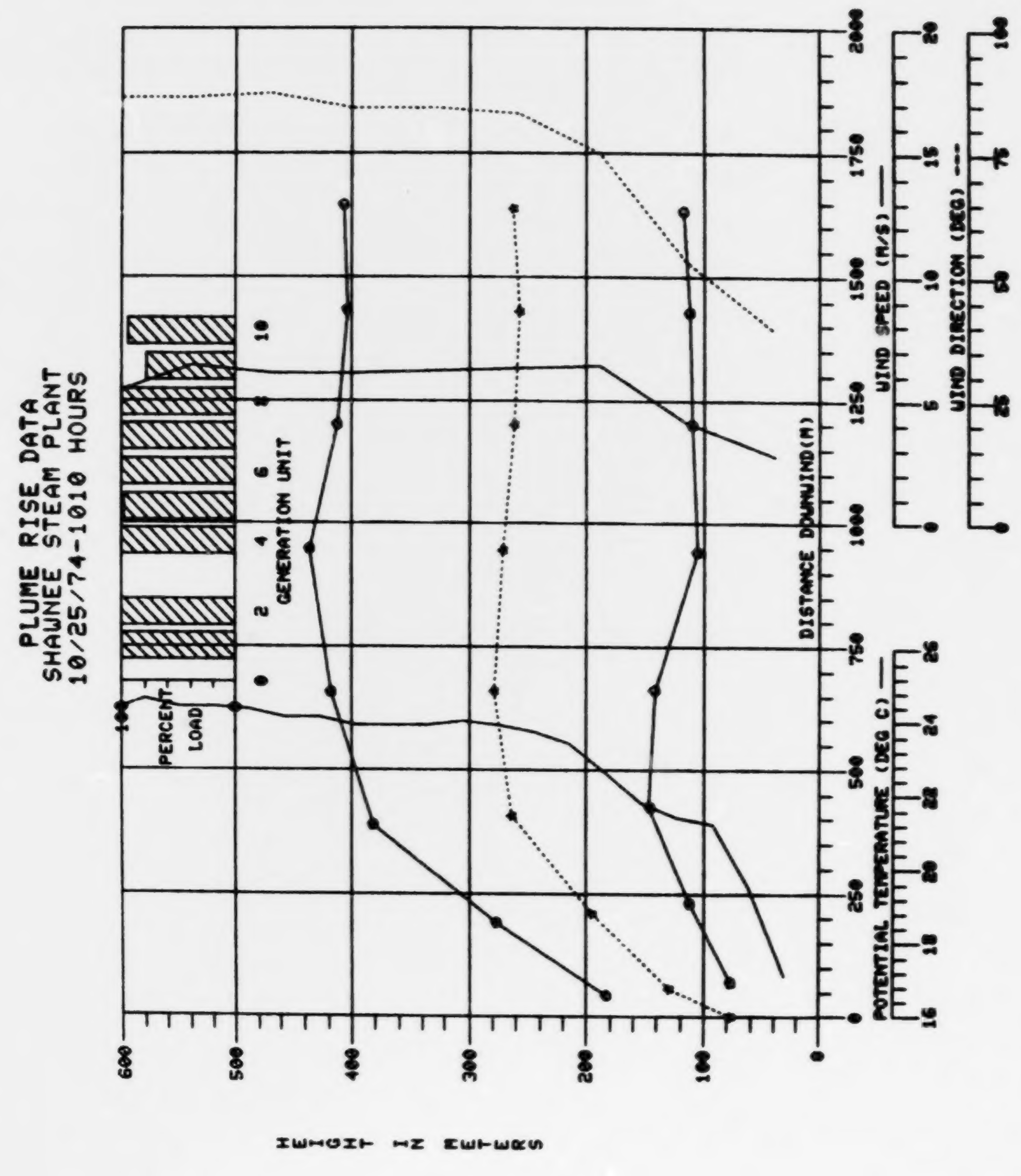
UNIT	1-4
UBAR (M/S)	5.7
DIR (DEG)	74
DT/DZ(C/100M)	1.10
UAD (M/S)	4.0
TAD (K)	293

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.4	8.1

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	426
VO (M/S)	15.9
FM (M4/S2)	748
FB (M4/S3)	209
LM (M)	4.8
LB (M)	1.1
NO.STACKS	9


PLUME RISE DATA
SHAWNEE STEAM PLANT
10/25/74-1010 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
POTENTIAL TEMPERATURE (DEG C)
WIND SPEED (M/S)
WIND DIRECTION (DEG)

OBSERVED PLUME RISE AND ATMOSPHERIC DATA

SHAWNEE STEAM PLANT 11/13/74- 805 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 800 - 818 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
16	1	12	20	14	10	9
77	-1	72	45	74	22	22
186	-1	181	73	183	36	37
318	-11	319	102	318	45	56
452	-8	452	120	452	56	63
591	11	588	142	589	76	64
LR	LR	823	175	----	---	---
LR	LR	1102	171	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5

CS#= 8 BETA= 14 DIR= 0

TEMPERATURE EPSILON AND WIND PROFILES

ELEV (M)	AIRCRAFT 800 & 815 POTENTIAL TEMP (C)	AIRCRAFT 800 & 815 GRAD (DC/100M)	E	PIBALS 800& 815 SPEED (M/S)	PIBALS 800& 815 DIR (WIND TO) (DEG)
50	5.6	0.4	4.3	6.9	354
100	5.9	0.9	4.5	8.2	360
150	6.5	1.8	3.9	9.6	7
200	7.9	3.8	2.3	11.0	12
250	9.8	3.4	1.4	12.2	13
300	10.9	1.1	1.0	13.0	15
350	11.4	0.6	0.9	13.5	16
400	11.6	0.7	0.9	14.0	17
450	12.0	0.5	0.9	15.2	19
500	12.1	0.4	0.9	15.6	19
550	12.4	0.5	0.9	15.3	20
600	12.6	0.6	0.9	14.6	23
650	12.9	0.4	0.9	15.2	24
700	13.1	0.5	0.9	15.7	26
750	13.4	0.7	0.9	15.5	29
800	13.7	0.2	0.8	14.8	32
850	13.8	0.3	0.8	15.0	35
TOWER	3.6	-0.6		4.0	68

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	143	436
2	158	432
3	154	424
4	---	---
5	119	421
6	150	431
7	155	416
8	159	416
9	---	---
10	---	---

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X= 589(M)
Z= 76(M)
R= 64(M)
SLOPE=0.15

AVERAGED METEOROLOGICAL CONDITIONS

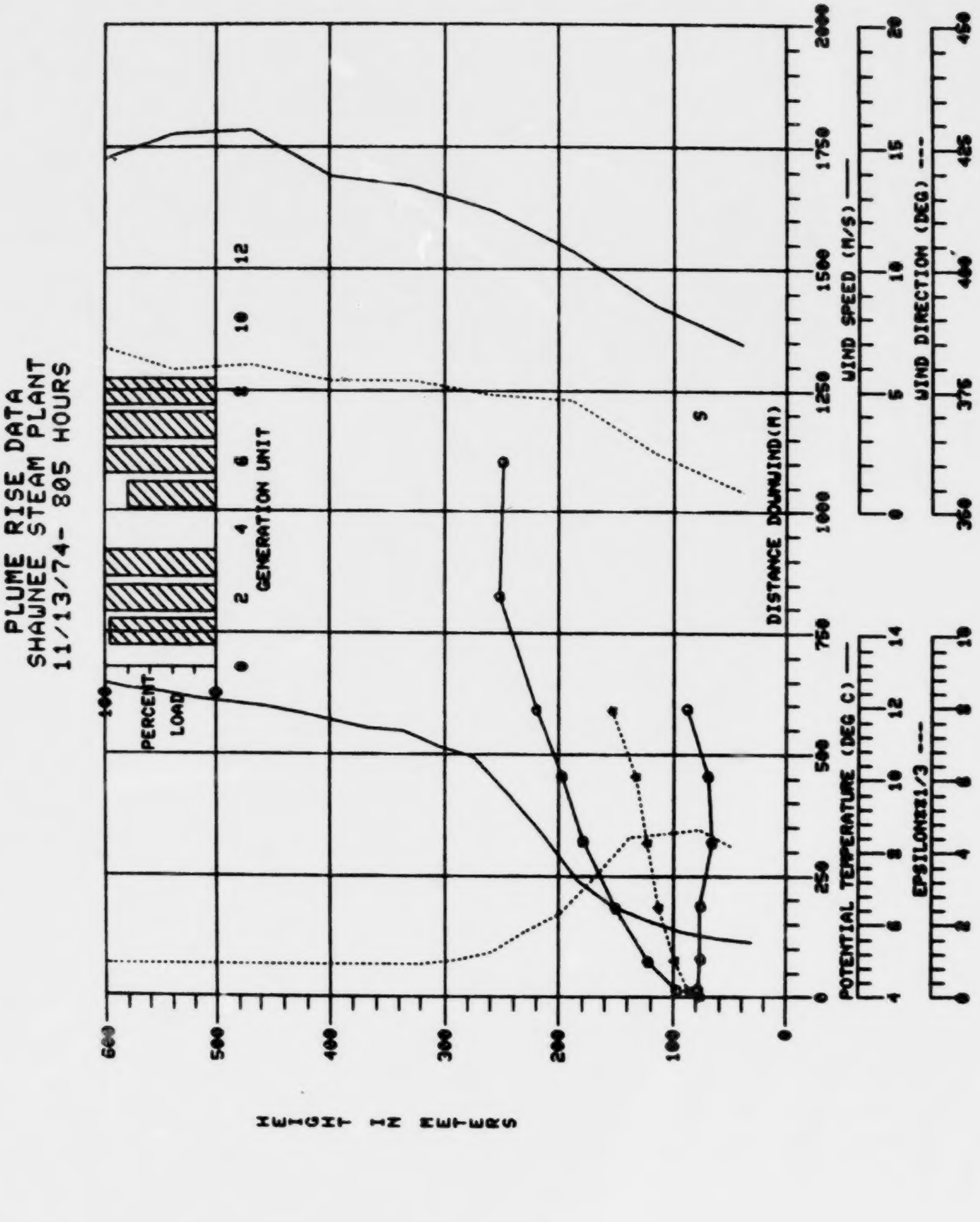
UNIT	1-4
UBAR (M/S)	9.5
DIR (DEG)	7
DT/DZ(C/100M)	2.10
UA0 (M/S)	8.3
TA0 (K)	278
EPSILON**1/3	3.7

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
2.7	8.4

AVERAGE EXIT CONDITIONS

UNIT	1-4
T0 (K)	419
V0 (M/S)	15.9
FM (M4/S2)	722
FB (M4/S3)	226
LM (M)	2.8
LB (M)	0.3
NO.STACKS	7


PLUME RISE DATA
SHAWNEE STEAM PLANT
11/13/74- 805 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
WIND SPEED (M/S)
WIND DIRECTION (DEG)
POTENTIAL TEMPERATURE (DEG C)
HEIGHT IN METERS

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 11/13/74- 920 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 912 - 930 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
16	5	12	20	14	12	7
62	1	59	40	60	20	19
116	-1	112	59	114	29	29
197	-6	192	81	194	37	43
289	-14	286	104	287	45	58
396	-17	399	123	397	53	69
500	-29	502	133	501	52	80
597	-38	609	145	603	53	91
LR	LR	819	174	----	---	---
LR	LR	1096	180	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 8 BETA= 9 DIR= 5

TEMPERATURE EPSILON AND WIND PROFILES

ELEV (M)	POTENTIAL TEMP (C) (AIRCRAFT 900 & 915)	GRAD (DC/100M)	E	SPEED (WIND (M/S) (PIBALS 900& 912)	DIR TO) (DEG)
50	8.6	0.5	3.5	6.9	349
100	8.8	0.4	4.0	8.3	349
150	9.1	0.5	3.3	9.4	352
200	9.4	1.0	3.2	11.0	358
250	10.2	2.5	3.3	14.0	3
300	11.5	2.2	2.8	15.6	8
350	12.5	2.0	1.9	16.7	11
400	13.3	0.7	1.1	17.8	13
450	13.6	0.5	1.6	18.6	13
500	13.7	0.3	1.6	19.7	13
550	13.9	0.5	1.1	20.5	14
600	14.2	0.6	0.9	19.9	15
650	14.6	0.8	0.9	19.0	18
700	14.9	0.5	0.9	18.7	20
750	15.1	0.4	1.1	19.5	22
800	15.2	0.2	1.0	20.8	23
850	15.4	0.3	0.9	19.5	26
TOWER	6.1	-1.1		4.0	68

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	150	436
2	152	436
3	154	425
4	---	---
5	142	424
6	150	434
7	151	426
8	153	416
9	---	---
10	---	---

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X= 603(M)
Z= 53(M)
R= 91(M)
SLOPE=0.01

AVERAGED METEOROLOGICAL CONDITIONS

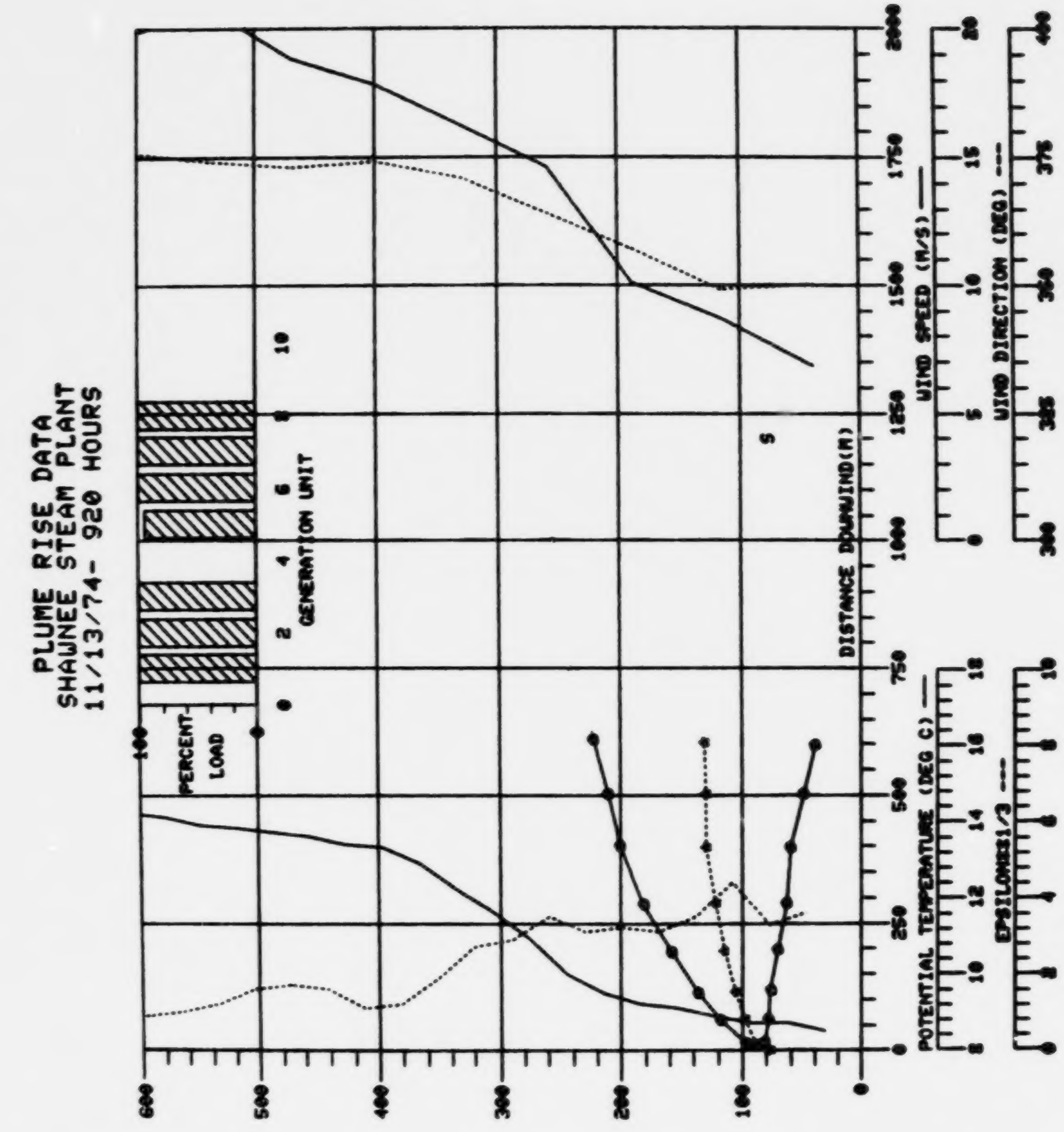
UNIT	1-4
UBAR (M/S)	9.5
DIR (DEG)	353
DT/DZ(C/100M)	0.64
UA0 (M/S)	8.4
TA0 (K)	281
EPSILON**1/3	3.5

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
4.1	10.5

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	422
VO (M/S)	16.1
FM (M4/S2)	744
FH (M4/S3)	227
LM (M)	2.9
LH (M)	0.3
NO.STACKS	7


PLUME RISE DATA
SHAWNEE STEAM PLANT
11/13/74- 920 HOURS
HEIGHT IN METERS
DISTANCE DOWNWIND(M)
PERCENT LOAD
GENERATION UNIT
WIND SPEED (M/S)
WIND DIRECTION (DEG)
POTENTIAL TEMPERATURE (DEG C)
EPSILON**1/3

OBSERVED PLUME RISE AND ATMOSPHERIC DATA

SHAWNEE STEAM PLANT 11/13/74-1010 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 1002 - 1020 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
7	4	4	18	5	11	10
76	2	71	39	73	20	18
177	2	173	65	175	33	31
274	-16	272	83	273	33	49
397	-15	396	94	396	39	54
574	-47	592	129	583	41	88
LR	LR	777	158	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5

CS#= 8 BETA= -1 DIR= 15

TEMPERATURE EPSILON AND WIND PROFILES

ELEV (M)	AIRCRAFT 1000 & 1015 POTENTIAL TEMP (C)	GRAD (DC/100M)	E	PIBALS 1000&1020 SPEED (WIND TO) (M/S)	DIR (DEG)
50	11.6	-0.1	5.8	10.0	355
100	11.7	0.3	5.2	18.3	359
150	11.8	-0.1	5.1	19.8	358
200	11.7	0.0	4.6	17.3	357
250	11.8	0.1	4.8	13.1	1
300	12.0	0.5	5.0	13.3	8
350	12.2	0.3	5.7	15.3	8
400	12.3	0.9	5.4	16.8	2
450	12.9	0.9	4.2	13.2	8
500	13.4	0.9	4.1	12.5	20
550	13.9	1.0	3.0	15.5	29
600	14.4	1.3	2.1	22.2	27
650	15.0	0.9	1.3	24.3	27
700	15.4	1.1	1.5	24.6	26
750	15.9	0.7	1.1	24.5	25
800	16.3	0.6	0.9	23.8	27
850	16.5	0.2	0.9	20.7	27
TOWER	9.4	-2.3		5.4	68

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	147	438
2	153	433
3	151	425
4	---	---
5	134	424
6	152	432
7	141	415
8	154	419
9	---	---
10	---	---

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X= 583(M)
Z= 41(M)
R= 88(M)
SLOPE=0.01

AVERAGED METEOROLOGICAL CONDITIONS

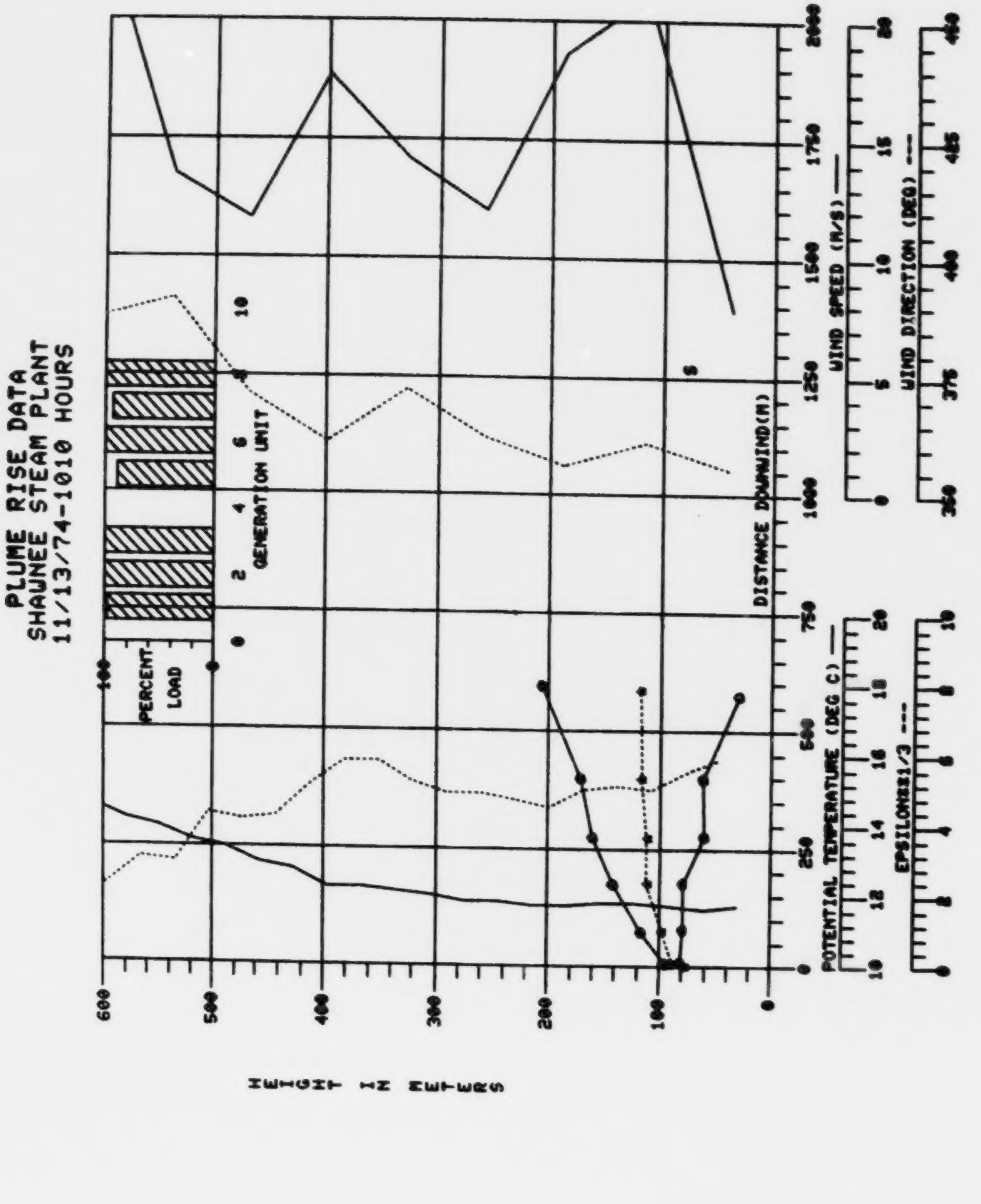
UNIT	1-4
UBAR (M/S)	18.9
DIR (DEG)	359
DT/DZ(C/100M)	0.04
UA0 (M/S)	18.7
TA0 (K)	284
EPSILON**1/3	5.0

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
-6.3	0.6

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	421
VO (M/S)	15.8
FM (M4/S2)	725
FB (M4/S3)	217
LM (M)	1.4
LB (M)	0.0
NO.STACKS	7


PLUME RISE DATA
SHAWNEE STEAM PLANT
11/13/74-1010 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
WIND SPEED (M/S)
WIND DIRECTION (DEG)
POTENTIAL TEMPERATURE (DEG C)
EPSILON**1/3

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT   11/14/74- 805 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 800 - 818 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
99	-1	75	99	87	49	51
236	65	198	175	217	120	58
427	103	377	298	402	200	100
657	126	596	391	626	258	135
904	147	860	477	882	312	165
1223	198	1183	566	1203	382	184
1582	248	1552	624	1567	436	188

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 5 BETA=-13 DIR=120

TEMPERATURE EPSILON AND WIND PROFILES

ELEV (M)	TEMP (C) (AIRCRAFT 800 & 815)	POTENTIAL GRAD (DC/100M)	E	SPEED (M/S) (PIBALS 800& 820)	DIR (WIND TO) (DEG)
50	0.9	0.2	3.7	5.1	107
100	1.2	0.7	2.9	5.8	106
150	1.5	0.7	2.6	5.9	106
200	1.8	0.5	2.5	5.8	108
250	1.9	0.0	2.7	5.8	110
300	1.9	0.0	2.5	6.1	112
350	1.9	0.1	3.2	6.4	114
400	2.0	0.1	3.4	6.6	115
450	2.0	0.1	2.9	6.2	117
500	2.1	0.3	2.3	6.4	120
550	2.3	0.2	2.5	6.8	122
600	2.2	-0.1	2.2	6.6	123
650	2.3	0.1	2.4	6.1	125
700	2.4	0.2	2.6	6.6	127
750	2.4	0.1	2.2	7.1	131
800	2.5	0.1	2.2	6.6	134
850	2.5	0.1	2.2	7.9	136
900	2.6	-0.0	2.2	8.3	132
950	2.7	0.3	2.2	8.2	135
TOWER	-0.5	0.0		5.8	180

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	149	439
2	152	436
3	154	426
4	---	---
5	150	419
6	143	430
7	150	419
8	---	---
9	---	---
10	147	420

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X=1567(M)
Z= 436(M)
R= 183(M)
SLOPE=0.15

AVERAGED METEOROLOGICAL CONDITIONS

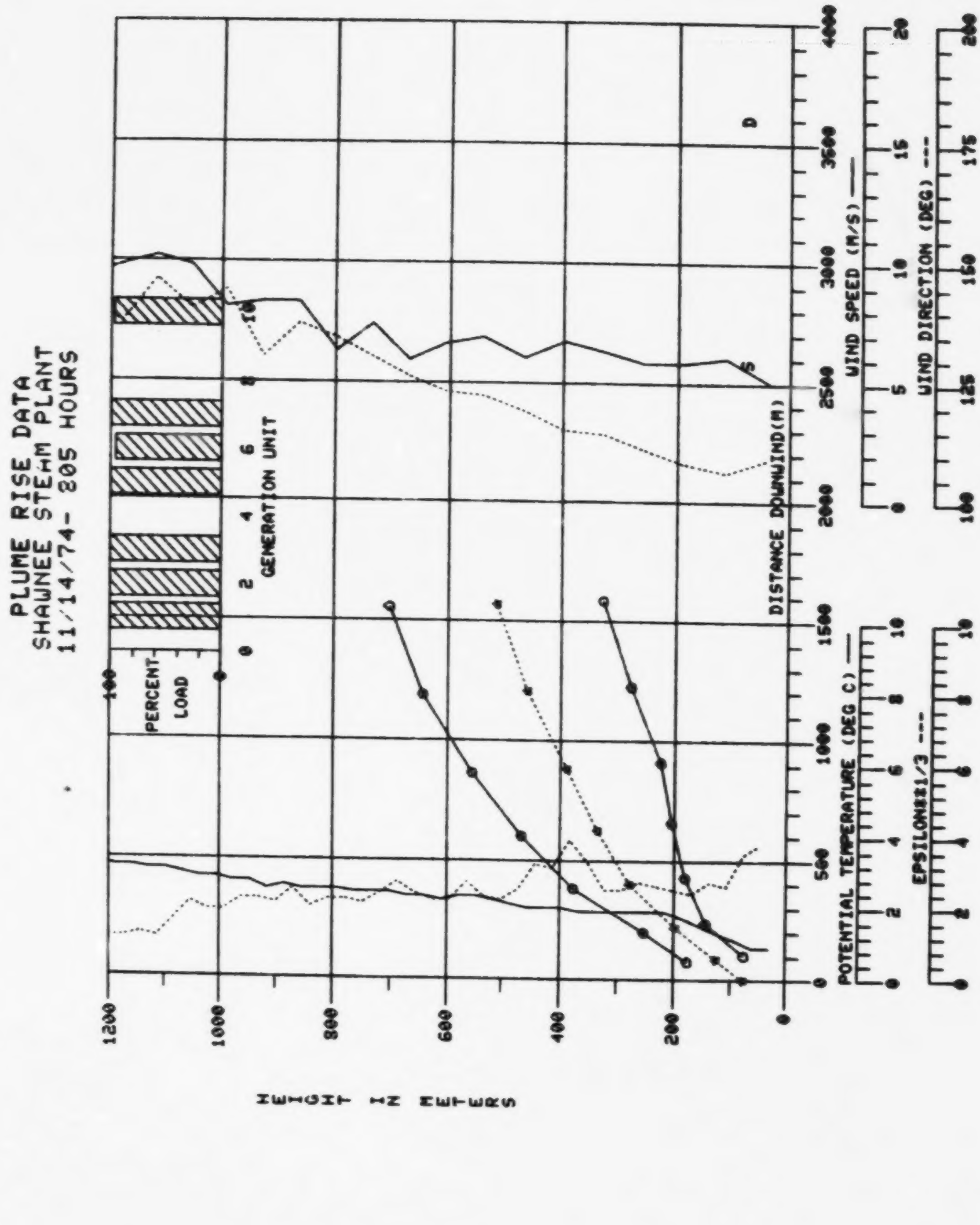
UNIT	1-4
UBAR (M/S)	6.2
DIR (DEG)	116
DT/DZ(C/100M)	0.23
UAO (M/S)	5.8
TAO (K)	274
EPSILON**1/3	2.7

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.2	3.8

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	421
VO (M/S)	15.9
FM (M4/S2)	714
FB (M4/S3)	235
LM (M)	4.3
LB (M)	1.0
NO.STACKS	7


PLUME RISE DATA
SHAWNEE STEAM PLANT
11/14/74- 805 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
WIND SPEED (M/S) ——
WIND DIRECTION (DEG) ---
POTENTIAL TEMPERATURE (DEG C) ——
EPSILON**1/3 ---
HEIGHT IN METERS

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 11/14/74- 905 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 900 - 918 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
104	7	91	81	97	44	36
229	21	211	124	220	72	52
404	37	386	203	395	120	82
611	43	602	302	606	172	126
880	58	875	359	877	208	148
1101	89	1049	404	1095	246	156
1299	108	1289	445	1294	276	167

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 5 BETA=-13 DIR=120

TEMPERATURE EPSILON AND WIND PROFILES

ELEV (M)	POTENTIAL TEMP (C) (AIRCRAFT 900 & 915)	POTENTIAL GRAD (DC/100M) (AIRCRAFT 900 & 915)	E	SPEED (M/S) (PIBALS 900& 915)	DIR (WIND TO) (DEG) (PIBALS 900& 915)
50	1.5	0.7	3.8	3.2	104
100	1.8	0.4	3.3	4.3	101
150	2.0	0.2	3.4	4.2	110
200	2.1	0.3	3.5	4.2	120
250	2.2	0.1	3.4	5.4	117
300	2.3	0.1	3.0	6.3	117
350	2.3	0.4	3.5	7.4	116
400	2.5	0.1	3.6	8.6	116
450	2.3	-0.2	3.7	7.8	115
500	2.5	0.5	3.2	8.5	102
550	2.6	0.0	3.6	9.0	92
600	2.7	0.2	3.6	6.8	106
650	2.7	-0.2	3.6	6.3	118
700	2.7	0.2	3.2	6.8	121
750	2.8	0.4	3.1	8.3	122
800	2.9	-0.2	3.5	10.2	126
850	2.8	0.1	2.8	11.3	128
TOWER	-0.1	-0.4		3.6	180

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	150	437
2	132	428
3	154	427
4	---	---
5	151	419
6	146	430
7	153	419
8	---	---
9	---	---
10	152	423

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X=1294(M)
Z= 276(M)
R= 167(M)
SLOPE=0.15

AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	6.3
DIR (DEG)	113
DT/DZ(C/100M)	0.20
UAO (M/S)	4.3
TAO (K)	274
EPSILON**1/3	3.4

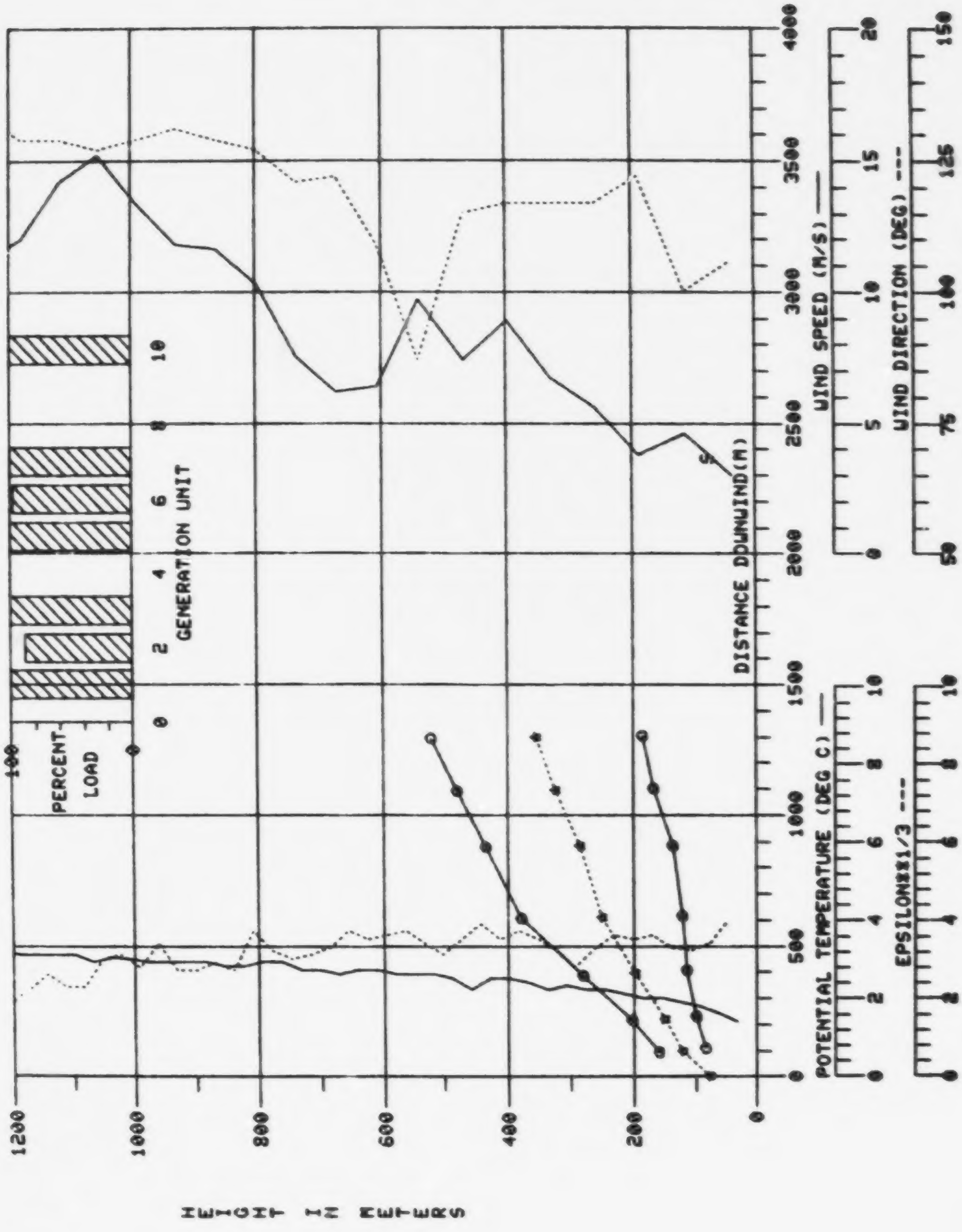
WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
1.3	-2.7

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	420
VO (M/S)	15.8
FM (M4/S2)	706
FB (M4/S3)	233
LM (M)	4.2
LB (M)	0.9
NO.STACKS	7

PLUME RISE DATA
SHAWNEE STEAM PLANT
11/14/74- 905 HOURS



OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT   11/15/74- 805 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 800 - 818 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	CENTER R (M)
54	1	50	37	52	19	17
122	-3	123	56	122	26	29
194	-8	207	75	200	33	40
LR	LR	683	129	----	---	---
LR	LR	1287	155	----	---	---
LR	LR	2021	159	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 3 BETA= -4 DIR= 70

TEMPFRATURE EPSILON AND WIND PROFILES

ELEV (M)	POTENTIAL TEMP (C) (AIRCRAFT 800 & 815)	GRAD (DC/100M)	E	SPEED (M/S) (PIBALS 755& 810)	DIR (WIND TO) (DEG)
50	3.2	0.5	3.8	5.5	53
100	3.4	0.6	3.5	7.8	60
150	3.8	0.8	3.4	9.8	64
200	4.3	1.3	2.5	11.4	67
250	5.0	1.3	1.8	12.1	68
300	5.5	0.9	1.0	12.2	69
350	6.0	0.5	0.9	12.0	68
400	6.1	0.5	0.9	11.8	66
450	6.4	0.2	0.9	11.4	64
500	6.4	0.1	0.9	11.0	64
550	6.6	0.5	0.9	10.4	66
600	6.8	0.4	0.9	9.4	66
650	7.0	0.4	0.9	8.6	66
700	7.2	0.2	0.9	8.5	66
750	7.3	0.2	1.0	8.6	66
800	7.3	0.0	1.1	8.3	66
850	7.5	0.7	1.1	8.5	67
TOWER	-1.5	-0.9		4.9	135

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	162	438
2	162	434
3	162	429
4	---	---
5	162	420
6	104	0
7	115	413
8	---	---
9	---	---
10	132	0

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X=	200(M)
Z=	33(M)
R=	40(M)
SLOPE=	0.09

AVERAGED METFOROLOGICAL CONDITIONS

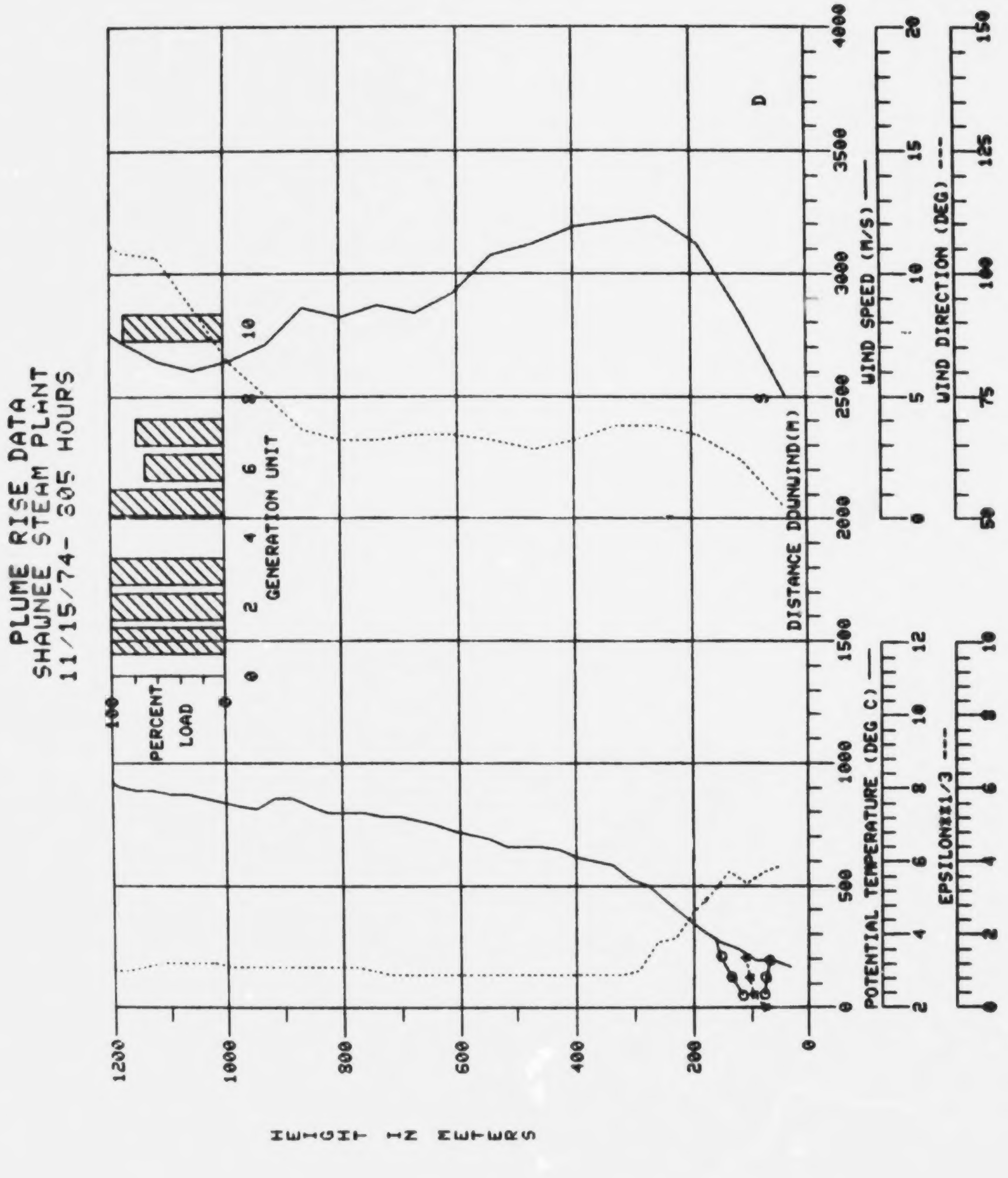
UNIT	1-4
UBAR (M/S)	8.3
DIR (DEG)	61
DT/DZ(C/100M)	0.66
UAO (M/S)	7.9
TAO (K)	276
EPSILON**1/3	3.6

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
3.8	6.8

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	422
VO (M/S)	16.5
FM (M4/S2)	774
FB (M4/S3)	242
LM (M)	3.3
LB (M)	0.4
NO.STACKS	5


PLUME RISE DATA
SHAWNEE STEAM PLANT
11/15/74- 305 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
WIND SPEED (M/S)
WIND DIRECTION (DEG)
POTENTIAL TEMPERATURE (DEG C)
EPSILON**1/3

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 11/15/74- 905 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 900 - 918 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
58	1	53	40	55	20	19
129	0	126	62	127	31	30
205	-4	217	95	211	45	48
LR	LR	682	221	----	---	---
LR	LR	1191	271	----	---	---
LR	LR	1785	326	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 3 BETA= -4 DIR= 70

TEMPERATURE EPSILON AND WIND PROFILES

ELEV (M)	POTENTIAL TEMP (C) [AIRCRAFT 900 & 922]	GRAD (DC/100M)	E	SPEED (M/S) [PIBALS 845& 900]	DIR (WIND TO) (DEG)
50	4.8	0.6	3.5	5.0	58
100	5.0	0.3	3.2	7.2	57
150	5.2	0.3	3.1	8.1	59
200	5.4	0.5	3.2	8.5	63
250	5.7	0.8	2.8	9.0	66
300	5.9	0.4	1.4	9.8	66
350	6.4	0.9	0.8	10.3	65
400	6.6	0.5	1.0	10.2	64
450	6.8	0.1	0.8	10.2	63
500	6.9	-0.1	0.8	9.7	62
550	6.8	0.2	0.8	9.1	61
600	6.9	0.1	0.8	8.7	59
650	7.0	0.1	0.8	9.1	58
700	7.1	0.3	0.8	8.3	59
750	7.2	0.1	0.8	7.2	62
800	7.3	0.3	0.8	7.0	68
850	7.3	-0.0	0.8	6.5	72
TOWER	3.6	-1.7		4.0	135

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	144	440
2	161	435
3	145	423
4	---	---
5	143	419
6	134	418
7	107	411
8	---	---
9	---	---
10	124	0

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X= 211(M)
Z= 45(M)
R= 43(M)
SLOPE=0.17

AVERAGED METEOROLOGICAL CONDITIONS

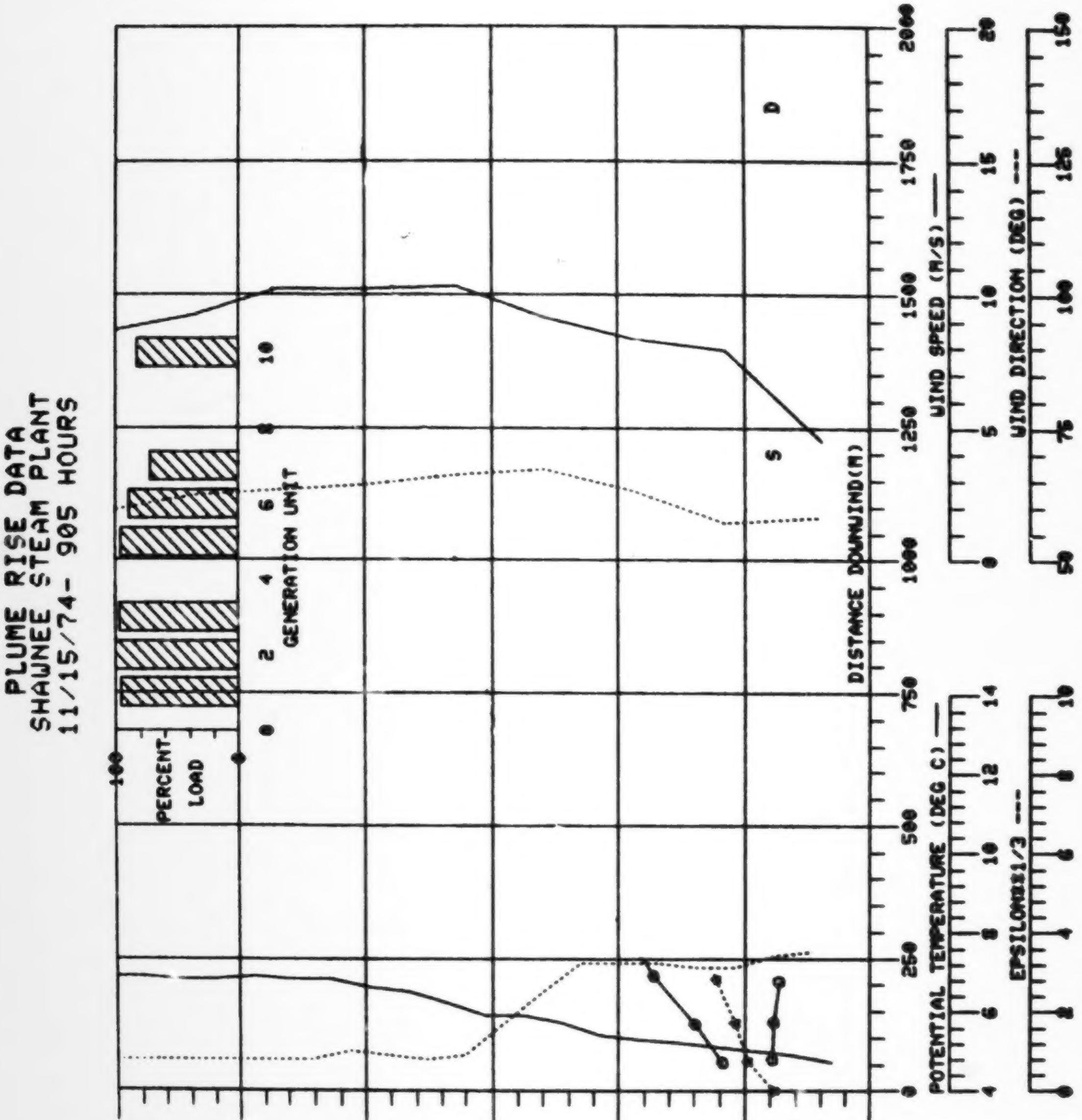
UNIT	1-4
UBAR (M/S)	7.7
DIR (DEG)	58
DT/DZ(C/100M)	0.33
UA0 (M/S)	7.3
TA0 (K)	277
EPSILON**1/3	3.2

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.5	8.2

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	419
VO (M/S)	15.0
FM (M4/S2)	647
FB (M4/S3)	216
LM (M)	3.3
LB (M)	0.5
NO.STACKS	6


PLUME RISE DATA
SHAWNEE STEAM PLANT
11/15/74- 905 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
WIND SPEED (M/S)
WIND DIRECTION (DEG)
POTENTIAL TEMPERATURE (DEG C)
S
D

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 11/21/74- 955 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 950 - 1008 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
103	-3	91	51	97	24	27
227	7	218	93	222	50	43
367	14	365	140	366	77	62
529	12	534	181	531	96	83
676	4	684	216	680	110	104
787	4	807	240	797	122	116
LR	LR	1501	366	----	---	---
LR	LR	2054	443	----	---	---
LR	LR	2541	541	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 5 BETA= -1 DIR=135

TEMPERATURE EPSILON AND WIND PROFILES

ELEV (M)	AIRCRAFT 1000 & 1010 POTENTIAL TEMP (C)	GRAD (DC/100M)	E	PIBALS 945&1000 SPEED (WIND TO) (M/S)	DIR (DEG)
50	8.5	-0.8	4.3	6.3	112
100	8.6	0.3	3.2	7.1	114
150	8.6	0.2	2.9	7.4	115
200	8.8	0.3	3.1	7.4	115
250	8.7	-0.0	2.9	7.6	114
300	8.9	0.2	3.0	6.3	114
350	8.9	0.1	3.7	5.7	117
400	9.0	0.1	5.0	6.5	122
450	9.2	0.5	4.0	7.7	129
500	9.4	0.4	3.0	9.3	128
550	9.4	0.4	3.0	10.6	128
600	9.6	-0.2	3.1	10.9	139
650	9.7	0.6	3.3	10.5	140
700	10.0	0.5	3.1		
750	10.2	0.9	3.9		
800	11.2	2.2	4.9		
850	12.3	2.8	3.5		
TOWER	7.2	-3.3		6.7	180

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	138	431
2	---	---
3	150	425
4	---	---
5	148	422
6	116	426
7	150	418
8	---	---
9	---	---
10	132	417

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X= 797(M)
Z= 122(M)
R= 116(M)
SLOPE=0.10

AVERAGED METEOROLOGICAL CONDITIONS

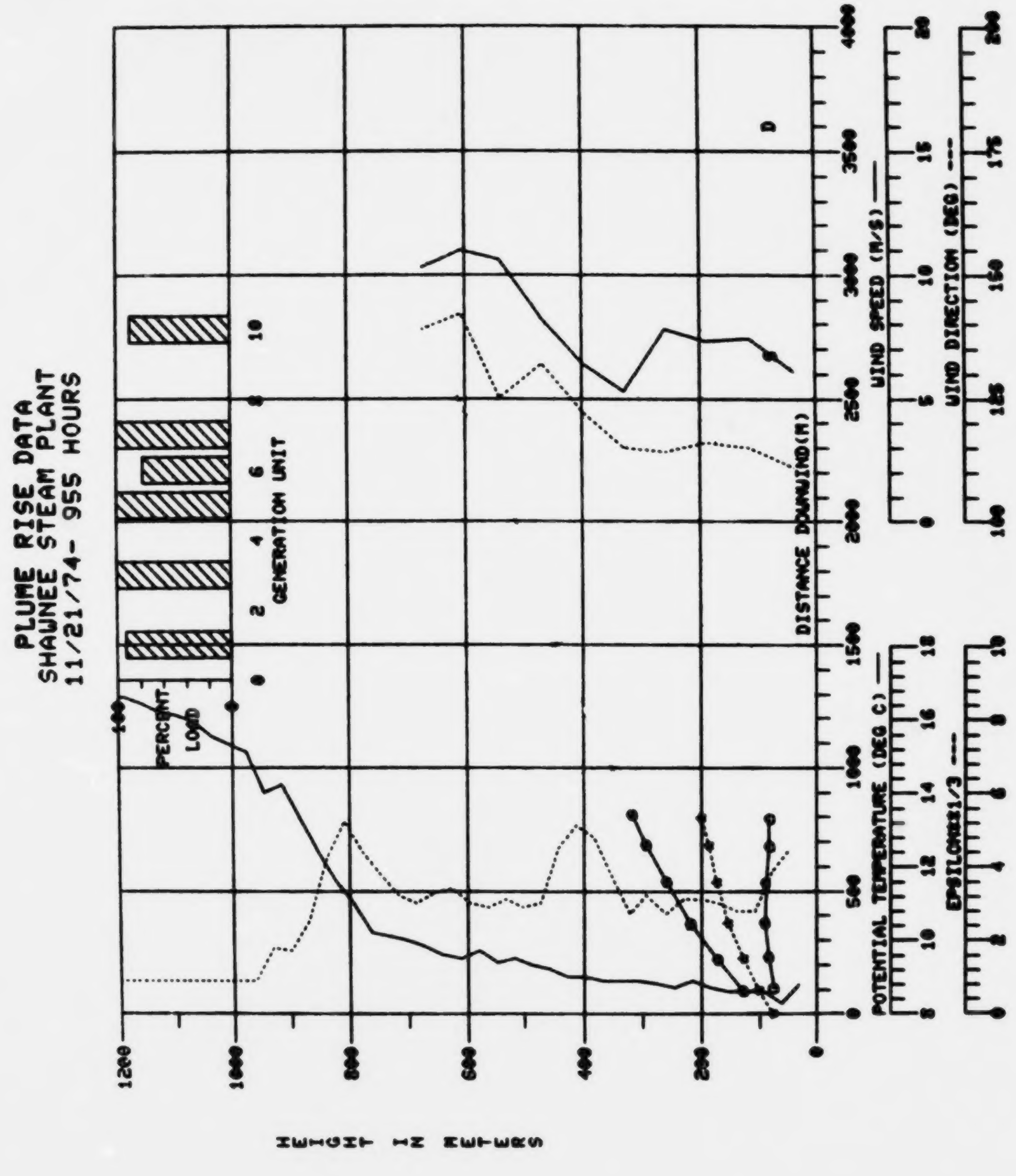
UNIT	1-4
UBAR (M/S)	7.2
DIR (DEG)	115
DT/DZ(C/100M)	0.19
UA0 (M/S)	7.2
TA0 (K)	281
EPSILON**1/3	3.0

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
-0.8	-0.3

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	417
VO (M/S)	14.8
FM (M4/S2)	643
FB (M4/S3)	205
LM (M)	3.5
LB (M)	0.5
NO.STACKS	6


PLUME RISE DATA
SHAWNEE STEAM PLANT
11/21/74- 955 HOURS
100
PERCENT LOAD
0
0 2 4 6 8 10
GENERATION UNIT
D
DISTANCE DOWNWIND(M)
0 500 1000 1500 2000 2500 3000 3500 4000
0 200 400 600 800 1000 1200
POTENTIAL TEMPERATURE (DEG C) —
8 10 12 14 16 18
EPSILON**1/3 ---
0 2 4 6 8 10
WIND SPEED (M/S) —
0 5 10 15 20
WIND DIRECTION (DEG) ---
100 125 150 175 200

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 11/21/74-1055 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 1050 - 1104 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
98	1	85	75	91	38	36
183	5	172	101	177	53	48
276	-1	272	129	274	64	65
372	-22	373	143	372	60	82
429	-38	448	159	438	60	98
LR	LR	1034	293	----	---	---
LR	LR	1732	464	----	---	---
LR	LR	2567	596	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 5 BETA= -1 DIR=135

TEMPERATURE EPSILON AND WIND PROFILES

ELEV (M)	AIRCRAFT 1100 & 1110 POTENTIAL TEMP (C)	GRAD (DC/100M)	E	PIBALS 1045&1100 SPEED (WIND TO) (M/S)	DIR (DEG)
50	10.0	0.4	4.6	8.2	111
100	10.1	-0.2	3.9	9.0	107
150	10.0	0.2	3.7	8.3	105
200	10.1	0.1	3.7	6.8	105
250	10.2	-0.3	3.5	5.2	113
300	10.1	0.2	2.9	5.5	128
350	10.1	-0.1	3.9	6.0	132
400	10.1	0.1	3.4	6.1	121
450	10.3	0.1	2.9	6.9	121
500	10.1	0.1	2.7	7.2	124
550	10.1	-0.3	2.7	7.3	128
600	10.1	0.7	2.9	8.5	134
650	10.5	0.3	3.0	10.5	138
700	10.5	0.3	2.6	11.7	138
750	11.0	1.4	2.7	12.5	138
800	11.8	2.4	3.1	14.0	137
850	13.1	2.0	2.9	16.6	136
TOWER	7.8	-4.4		5.8	180

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	130	435
2	---	---
3	148	425
4	---	---
5	140	423
6	116	426
7	152	420
8	---	---
9	---	---
10	128	419

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X= 438(M)
Z= 60(M)
R= 98(M)
SLOPE=0.0

AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	7.9
DIR (DEG)	106
DT/DZ(C/100M)	0.05
UA0 (M/S)	9.0
TA0 (K)	283
EPSILON**1/3	3.7

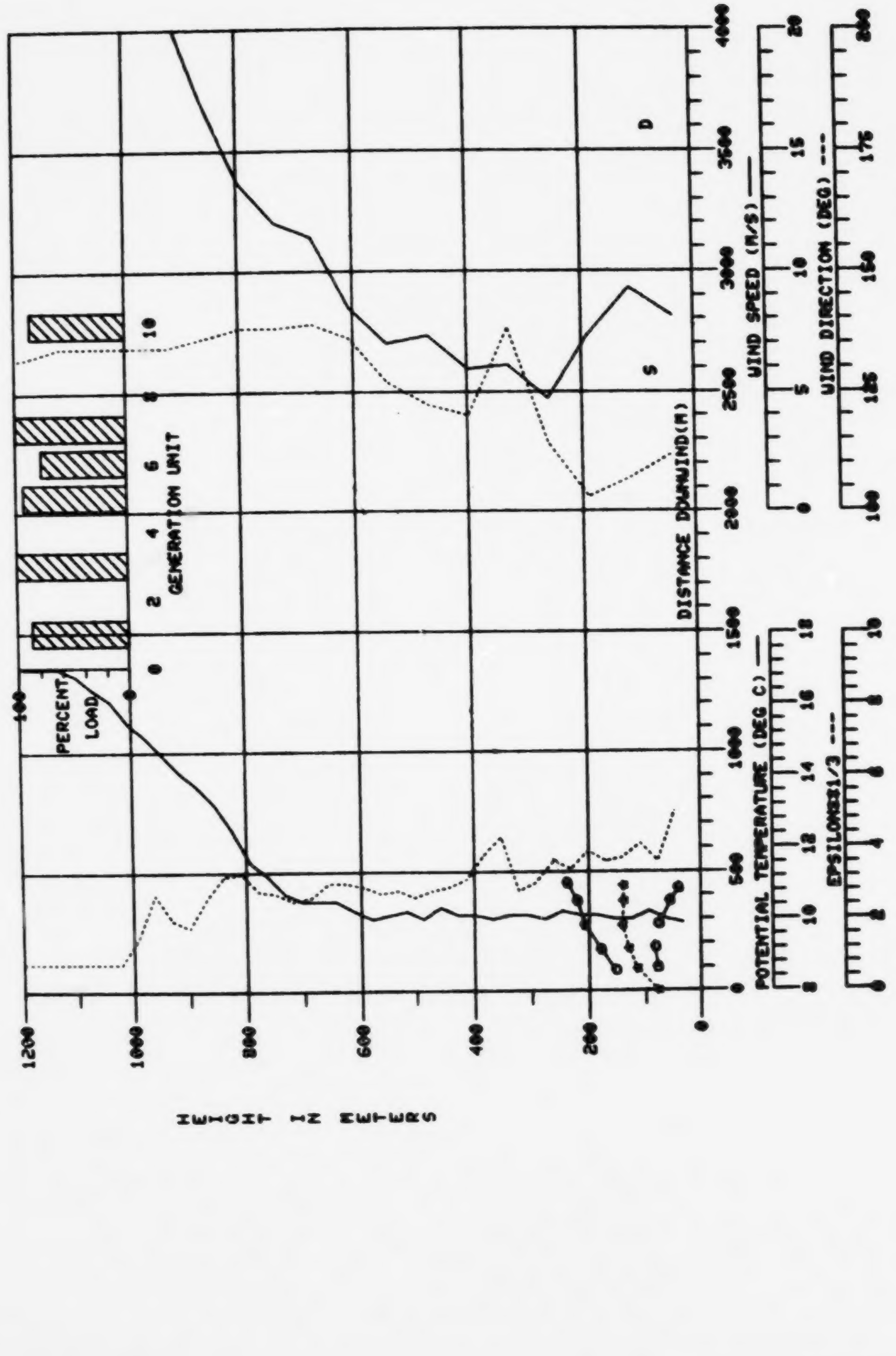
WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
-3.2	4.8

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	419
V0 (M/S)	14.6
FM (M4/S2)	620
FB (M4/S3)	200
LM (M)	3.2
LB (M)	0.4
NO.STACKS	6

PLUME RISE DATA
SHAWNEE STEAM PLANT
11/21/74-1055 HOURS



OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 12/ 5/74- 900 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 856 - 912 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
10	3	10	27	10	15	12
68	5	67	44	67	24	19
151	4	151	62	151	33	28
254	-1	254	80	254	39	40
364	-3	365	95	364	46	48
478	3	474	102	476	52	49
596	7	593	110	594	56	51
703	7	701	111	702	59	52
839	21	839	116	839	68	47
LR	LR	1164	129	----	---	---
LR	LR	1589	123	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 8 BETA= 11 DIR= 0

TEMPERATURE EPSILON AND WIND PROFILES

ELEV (M)	POTENTIAL TEMP (C) (AIRCRAFT 900 & 914)	GRAD (DC/100M)	E	SPEED (WIND TO) (M/S) (PIBALS 845& 900)	DIR (DEG)
50	3.3	2.3	3.7	3.5	330
100	4.5	2.1	3.8	6.4	349
150	5.6	2.5	2.5	8.6	355
200	6.9	2.5	1.6	9.7	357
250	7.9	2.3	1.5	9.1	356
300	8.9	1.1	1.3	7.9	360
350	9.5	1.3	1.2	6.9	7
400	10.1	0.9	1.2	6.2	15
450	10.3	0.3	1.2	5.9	18
500	10.5	0.4	1.2	5.9	17
550	10.7	0.5	1.2	6.1	18
600	11.0	0.5	1.3	6.1	25
650	11.3	0.7	1.2	6.2	33
700	11.6	0.7	1.3	6.0	38
750	11.9	0.9	1.3	5.8	38
800	12.7	1.8	1.3	5.9	35
850	13.4	1.0	1.2	6.1	33
TOWER	0.5	-0.2		3.1	45

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	---	---
2	---	---
3	112	422
4	---	---
5	137	413
6	155	421
7	144	421
8	145	417
9	---	---
10	132	425

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X= 839(M)
Z= 68(M)
R= 47(M)
SLOPE=0.07

AVERAGED METEOROLOGICAL CONDITIONS

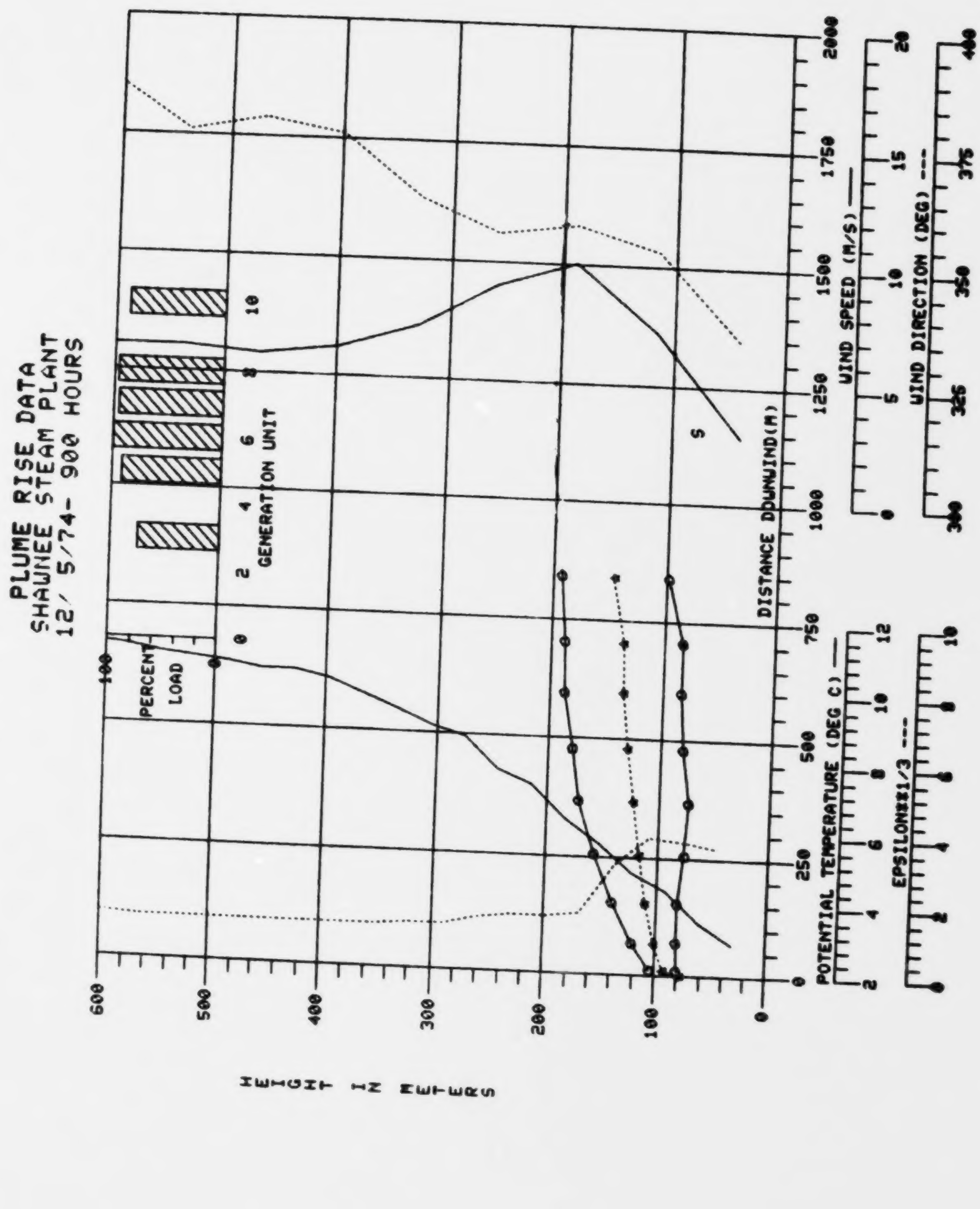
UNIT	1-4
UBAR (M/S)	7.8
DIR (DEG)	353
DT/DZ(C/100M)	2.35
UA0 (M/S)	6.6
TA0 (K)	276
EPSILON**1/3	2.9

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
1.3	2.1

AVERAGE EXIT CONDITIONS

UNIT	1-4
T0 (K)	414
V0 (M/S)	14.6
FM (M4/S2)	615
FB (M4/S3)	206
LM (M)	3.2
LB (M)	0.4
NO.STACKS	6


PLUME RISE DATA
SHAWNEE STEAM PLANT
12/ 5/74- 900 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
WIND SPEED (M/S)
WIND DIRECTION (DEG)
POTENTIAL TEMPERATURE (DEG C)
EPSILON**1/3

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OBSERVED PLUME RISE AND ATMOSPHERIC DATA

SHAWNEE STEAM PLANT 12/ 5/74- 955 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 950 - 1008 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	CENTER R (M)
12	4	3	27	7	15	17
61	1	41	56	51	28	29
128	-1	99	98	113	48	51
190	1	158	132	174	66	67
255	6	239	159	247	82	76
334	8	318	181	326	94	86
434	12	428	196	431	104	91
539	36	531	213	535	124	87
667	64	665	235	666	149	85
817	66	813	235	815	150	84
917	63	920	232	918	147	84
1040	68	1042	232	1041	150	81
LR	LR	1351	231	----	---	---
LR	LR	1705	208	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 3 BETA= 11 DIR= 10

TEMPRATURE EPSILON AND WIND PROFILES

ELEV (M)	AIRCRAFT 1000 & 1015 POTENTIAL TEMP (C)	AIRCRAFT 1000 & 1015 POTENTIAL GRAD (DC/100M)	E	PIBALS 945&1000 SPEED (WIND TO) (M/S)	PIBALS 945&1000 DIR (WIND TO) (DEG)
50	5.7	0.9	5.3	4.0	345
100	6.0	0.0	3.6	4.9	357
150	5.9	0.6	3.4	5.5	1
200	6.6	2.0	3.4	6.1	2
250	7.8	2.3	2.2	7.2	4
300	9.5	3.3	1.5	7.3	10
350	10.3	1.1	1.6	7.2	15
400	10.8	1.2	1.6	7.3	19
450	11.1	0.0	1.6	7.4	20
500	11.1	0.2	1.8	7.4	20
550	11.3	0.5	2.0	7.4	21
600	11.6	0.4	2.0	7.2	24
650	11.7	0.4	2.1	7.1	29
700	12.0	0.7	2.1	7.0	30
750	12.4	1.0	2.0	6.8	29
800	13.0	1.1	2.0	6.8	27
850	13.5	0.8	1.9	6.9	26
TOWER	4.7	-1.7		2.7	68

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	---	---
2	---	---
3	115	422
4	---	---
5	134	415
6	155	429
7	135	422
8	145	418
9	---	---
10	132	425

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X=1041(M)
Z= 150(M)
R= 81(M)
SLOPE=0.02

AVERAGED METEOROLOGICAL CONDITIONS

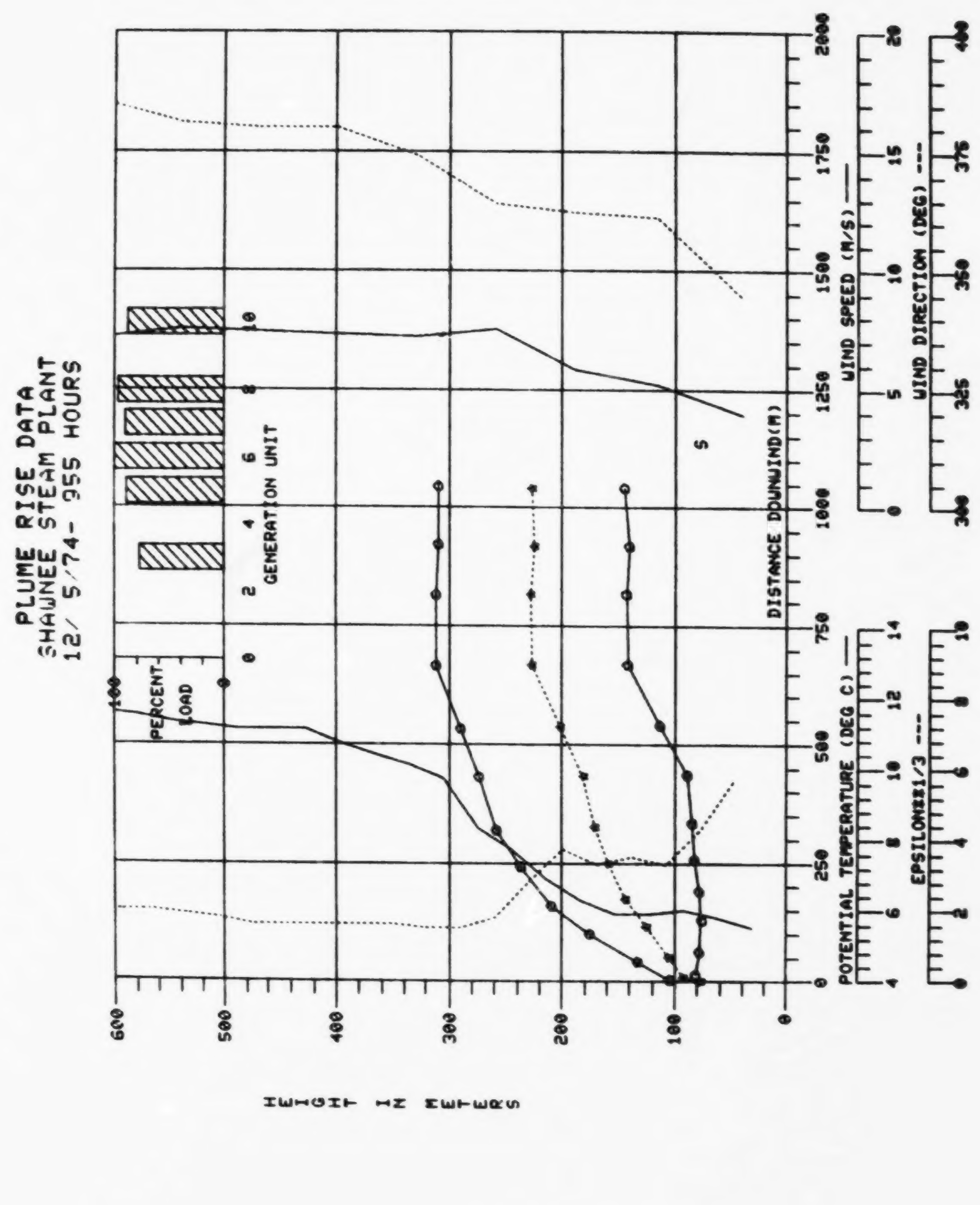
UNIT	1-4
UBAR (M/S)	6.2
DIR (DEG)	3
DT/DZ(C/100M)	1.66
UA0 (M/S)	5.0
TA0 (K)	278
EPSILON**1/3	2.9

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
1.1	5.7

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	416
VO (M/S)	14.5
FM (M4/S2)	609
FB (M4/S3)	204
LM (M)	4.0
LB (M)	0.9
NO.STACKS	6


PLUME RISE DATA
SHAWNEE STEAM PLANT
12/ 5/74- 955 HOURS
PERCENT LOAD
GENERATION UNIT
DISTANCE DOWNWIND(M)
POTENTIAL TEMPERATURE (DEG C) —
EPSILON**1/3 ---
WIND SPEED (M/S) —
WIND DIRECTION (DEG) ---

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT   12/ 5/74-1055 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 1050 - 1108 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	CENTER R (M)
17	1	6	25	11	13	14
112	-5	85	81	98	38	44
242	-10	186	152	215	71	65
370	0	309	226	339	113	116
523	32	454	293	488	162	134
730	61	664	354	697	207	150
944	48	926	394	935	221	173
LR	LR	1285	397	----	---	---
LR	LR	1671	416	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 8 BETA= 11 DIR= 6

TEMPERATURE EPSILON AND WIND PROFILES

ELEV (M)	AIRCRAFT 1100 & 1113 POTENTIAL TEMP (C)	GRAD (DC/100M)	E	PIBALS 1045&1100 SPEED (WIND TO) (M/S)	DIR (DEG)
50	8.3	-0.1	3.6	5.6	347
100	8.4	-0.1	3.2	6.3	346
150	8.4	0.2	2.8	6.6	345
200	8.5	0.6	2.8	6.9	345
250	9.0	1.0	3.2	7.4	348
300	9.2	0.4	3.3	7.3	352
350	9.7	1.2	2.9	7.5	360
400	10.4	1.7	2.4	8.1	12
450	10.8	0.2	2.2	8.0	17
500	11.3	1.3	1.6	7.8	17
550	11.7	0.3	1.7	7.5	15
600	11.9	0.5	1.7	7.4	16
650	12.2	0.5	1.7	6.7	18
700	12.4	0.8	1.8	6.3	18
750	12.9	1.2	1.8	6.2	17
800	13.8	1.4	1.9	6.2	17
850	14.3	1.0	1.8	5.4	18
TOWER	7.0	-2.7		3.1	68

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	---	---
2	---	---
3	123	424
4	---	---
5	145	416
6	150	0
7	136	423
8	145	420
9	---	---
10	126	425

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X= 935(M)
Z= 221(M)
R= 173(M)
SLOPE=0.06

AVERAGED METEOROLOGICAL CONDITIONS

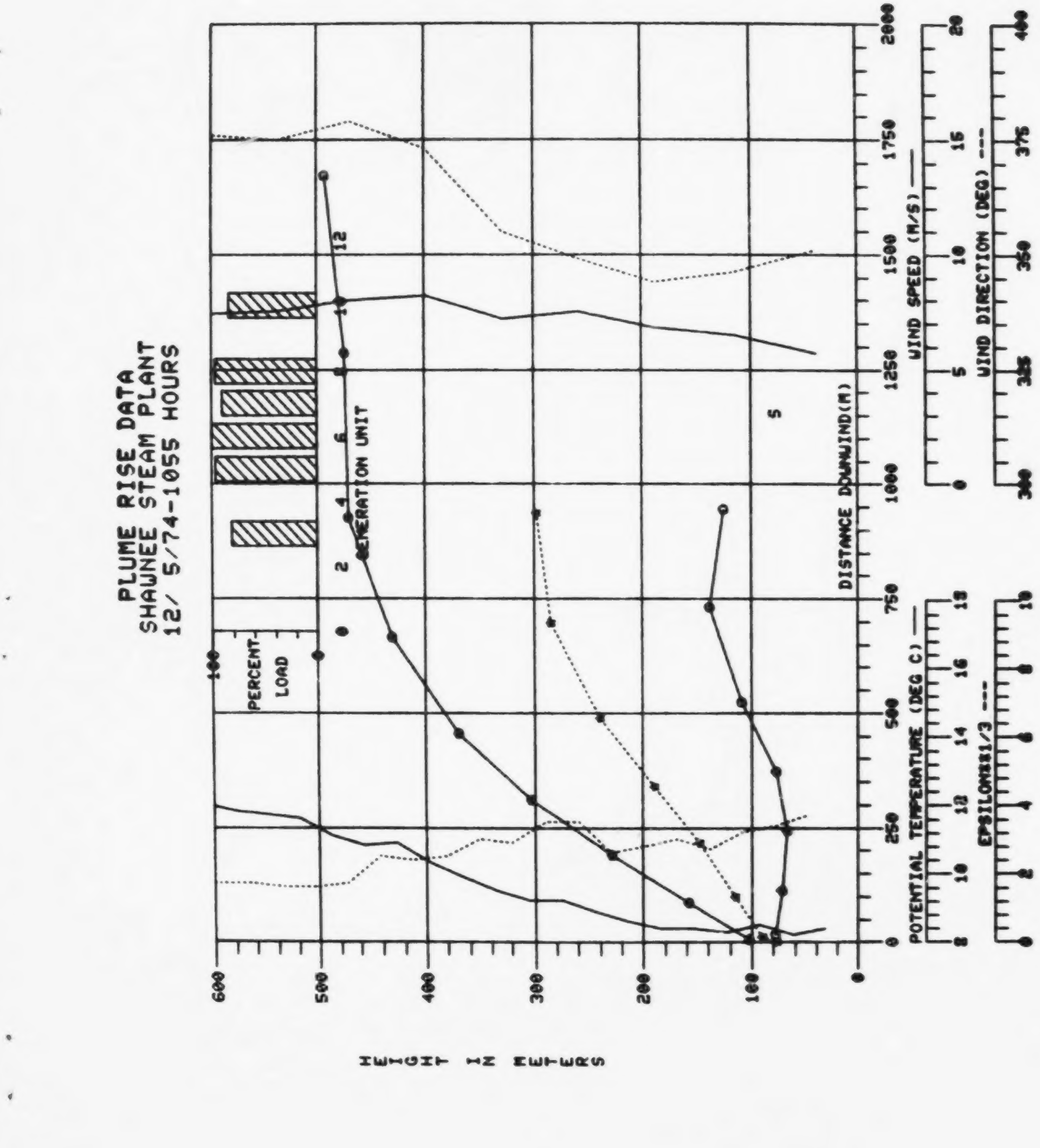
UNIT	1-4
UBAR (M/S)	7.3
DIR (DEG)	356
DT/DZ(C/100M)	0.66
UAC (M/S)	6.4
TAO (K)	281
EPSILON**1/3	2.9

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.3	9.2

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	416
VO (M/S)	14.3
FM (M4/S2)	601
FB (M4/S3)	197
LM (M)	3.4
LB (M)	0.5
NO.STACKS	5


PLUME RISE DATA
SHAWNEE STEAM PLANT
12/ 5/74-1055 HOURS
HEIGHT IN METERS
DISTANCE DOWNWIND(M)
PERCENT LOAD
GENERATION UNIT
POTENTIAL TEMPERATURE (DEG C)
EPSILON**1/3
WIND SPEED (M/S)
WIND DIRECTION (DEG)

OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT 12/ 5/74-1200 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 1152 - 1208 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
13	6	3	34	8	20	16
51	13	37	58	44	35	23
104	1	78	83	91	42	43
151	1	115	117	133	59	60
188	2	149	144	168	73	73
231	6	185	162	208	84	81
301	15	244	193	272	104	93
370	21	313	227	341	124	106
449	21	389	264	419	142	124
521	22	464	289	492	155	136
584	-4	539	319	561	157	160
667	-44	652	358	659	157	200

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 8 BETA= 11 DIR= 0

TEMPERATURE EPSILON AND WIND PROFILES

ELEV (M)	AIRCRAFT 1200 & 1212 POTENTIAL TEMP (C)	GRAD (DC/100M)	E	PIBALS 1145&1200 SPEED (M/S)	DIR (WIND TO) (DEG)
50	9.7	0.2	5.1	2.5	346
100	9.7	0.0	3.8	2.5	342
150	9.9	0.4	3.4	2.8	341
200	9.9	0.0	2.8	3.5	344
250	9.9	-0.0	3.1	4.2	351
300	9.7	-0.1	3.6	4.5	353
350	10.0	0.6	3.0	5.1	355
400	10.2	0.3	2.8	6.0	1
450	10.3	0.1	2.8	6.9	5
500	10.5	0.6	3.5	7.5	7
550	10.8	0.7	3.1	7.9	9
600	10.9	0.2	2.7	7.9	9
650	11.4	1.4	2.1	8.0	10
700	12.0	0.8	1.8	7.5	12
750	12.5	1.1	1.8	6.7	14
800	13.1	1.8	1.9	5.7	15
850	13.7	1.0	2.2	4.8	19
TOWER	8.7	-2.7		3.6	45

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	---	---
2	---	---
3	129	423
4	---	---
5	144	422
6	148	429
7	139	423
8	145	425
9	---	---
10	129	424

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE

X= 659(M)
Z= 157(M)
R= 200(M)
SLOPE=0.0

AVERAGED METEOROLOGICAL CONDITIONS

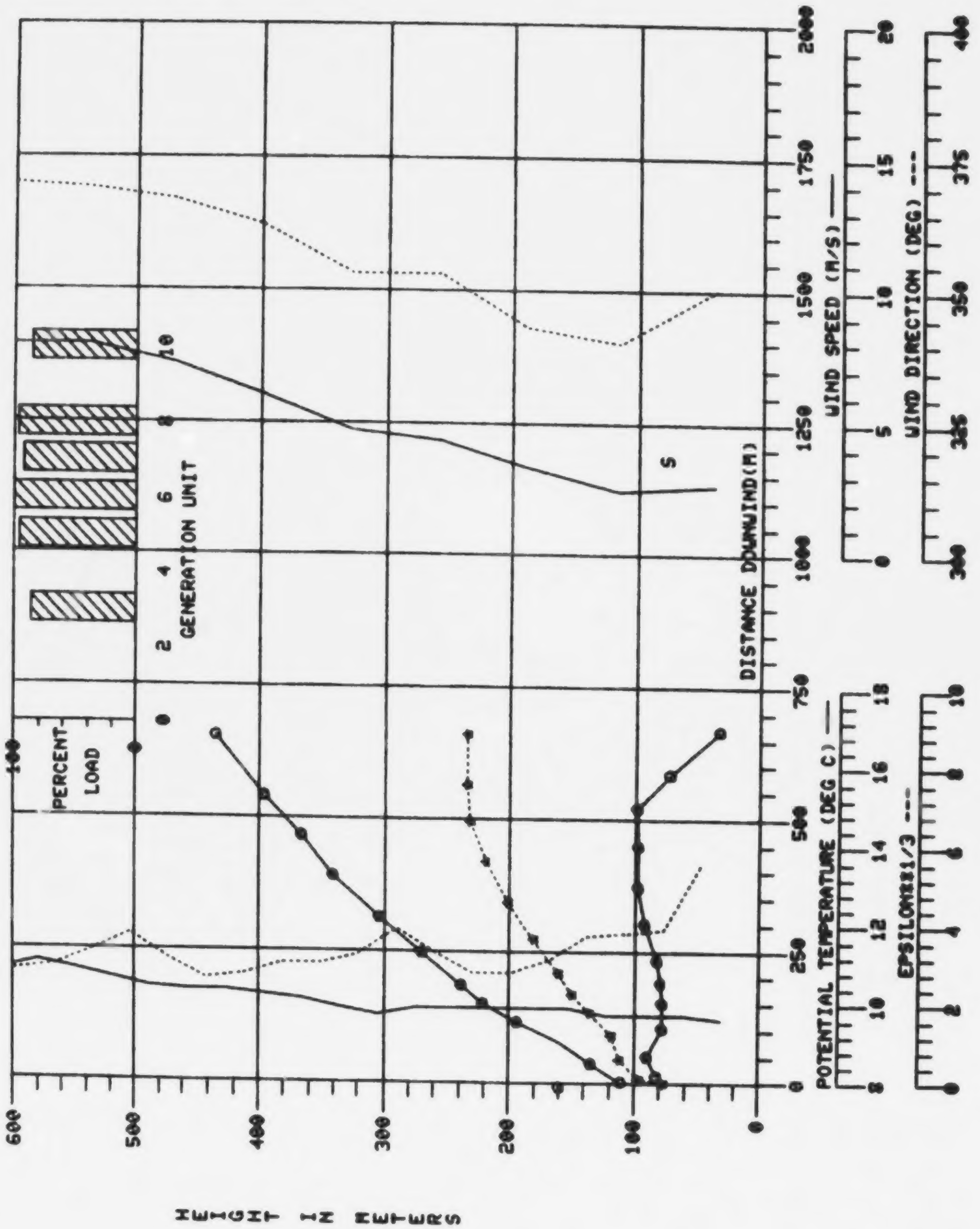
UNIT	1-4
UBAR (M/S)	4.2
DIR (DEG)	350
DT/DZ(C/100M)	0.17
UA0 (M/S)	2.5
TA0 (K)	282
EPSILON**1/3	3.2

WIND SHEAR SPEED (M/S/100M)	WIND SHEAR DIRECTION (DEG/100M)
1.3	7.8

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	419
VO (M/S)	14.8
FM (M4/S2)	640
FB (M4/S3)	205
LM (M)	6.1
LB (M)	2.9
NO.STACKS	6

PLUME RISE DATA
SHAWNEE STEAM PLANT
12/ 5/74-1200 HOURS



OBSERVED PLUME RISE AND ATMOSPHERIC DATA
SHAWNEE STEAM PLANT   12/ 5/74-1300 HOURS

PHOTOGRAPHIC DETERMINATIONS OF RELATIVE RISE - TOP & BOTTOM VS X FOR 1250 - 1310 HOURS

BOTTOM X (M)	BOTTOM Z (M)	TOP X (M)	TOP Z (M)	CENTER X (M)	CENTER Z (M)	R (M)
10	0	4	21	7	10	10
46	2	39	39	42	20	13
144	-5	133	73	136	34	39
225	2	213	100	219	51	49
308	2	301	136	304	69	66
391	-1	394	169	392	84	84
484	-18	494	200	489	91	109
571	-48	602	229	586	90	138
LR	LR	831	298	----	---	---
LR	LR	1230	396	----	---	---
LR	LR	1657	501	----	---	---

NOTE: THE X-Z ORIGIN IS BETWEEN STACKS 4 AND 5
CS#= 8 BETA= 11 DIR= 0

TEMPERATURE EPSILON AND WIND PROFILES

ELEV (M)	AIRCRAFT 1300 & 1313 POTENTIAL TEMP (C)	GRAD (DC/100M)	E	PIBALS 1245&1300 SPEED (WIND TO) (M/S)	DIR (DEG)
50	10.3	0.1	4.3	3.9	8
100	10.3	-0.4	3.8	4.6	360
150	10.4	0.5	3.7	5.1	355
200	10.5	0.5	3.3	5.4	353
250	10.7	0.3	2.7	5.7	354
300	10.8	0.1	2.8	6.1	354
350	10.9	0.1	2.8	6.0	354
400	10.9	0.0	2.8	5.4	355
450	11.1	0.3	2.5	5.4	354
500	11.0	-0.0	2.7	5.2	357
550	11.1	0.3	3.1	5.2	1
600	11.3	0.5	3.1	6.3	5
650	11.6	0.0	3.1	6.8	11
700	11.3	0.1	3.2	7.2	14
750	11.6	0.3	3.3	7.8	14
800	12.0	1.3	2.3	8.5	13
850	12.7	1.3	2.1	8.4	17
TOWER	8.9	-3.3		3.1	68

GENERATION AND PREHEATER EXIT TEMPERATURES

UNIT	LOAD (MW)	TEMP (K)
1	---	---
2	---	---
3	130	425
4	---	---
5	144	423
6	152	428
7	137	428
8	123	416
9	---	---
10	138	421

* * * SUMMARY VARIABLES * * *

OBSERVED FINAL RISE
X= 586(M)
Z= 90(M)
R= 138(M)
SLOPE=0.0

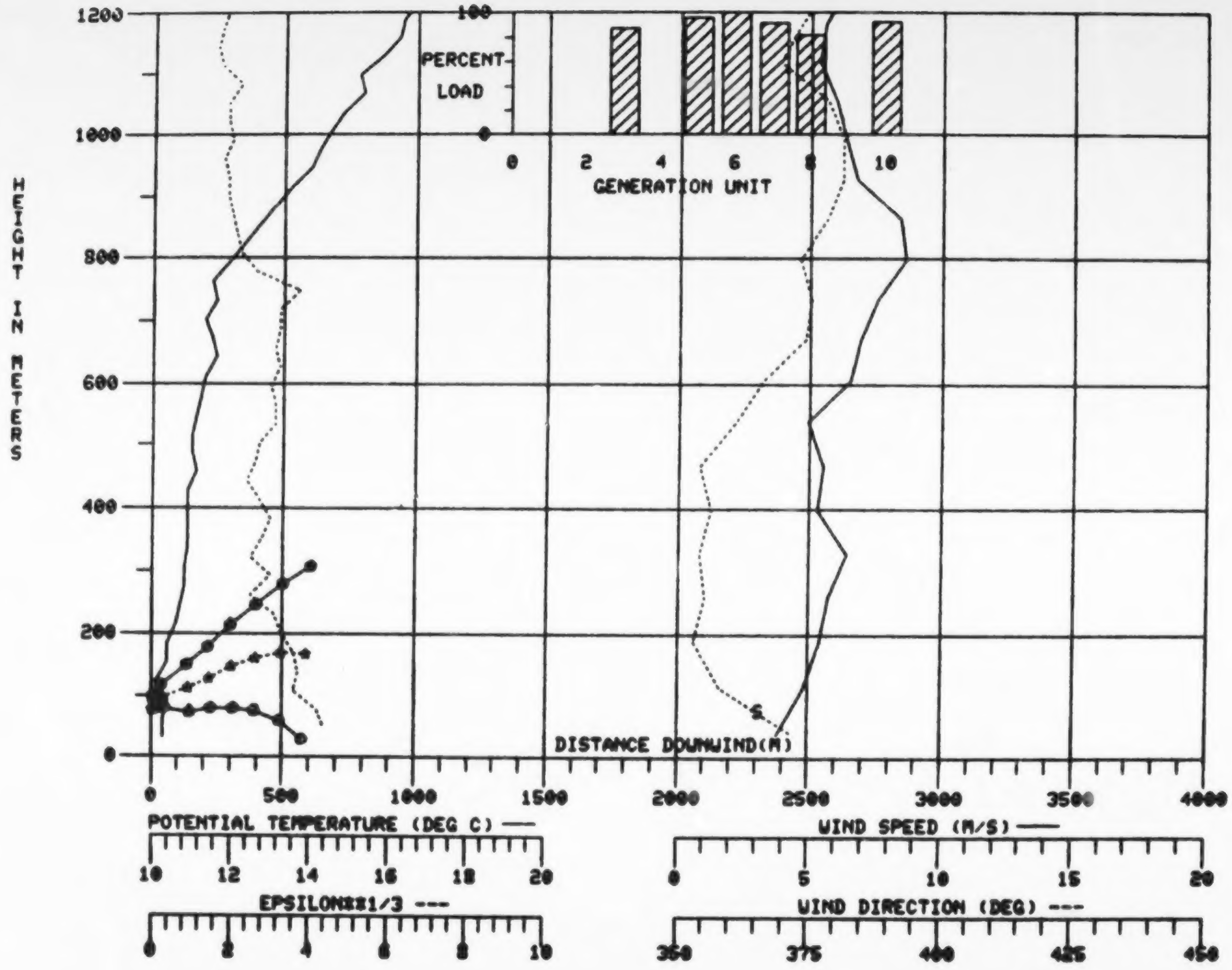
AVERAGED METEOROLOGICAL CONDITIONS

UNIT	1-4
UBAR (M/S)	5.3
DIR (DEG)	356
DT/DZ(C/100M)	0.20
UA0 (M/S)	4.7
TA0 (K)	283
EPSILON**1/3	3.3

WIND SHEAR

SPEED (M/S/100M)	DIRECTION (DEG/100M)
0.7	-1.4

AVERAGE EXIT CONDITIONS

UNIT	1-4
TO (K)	418
VO (M/S)	14.7
FM (M4/S2)	630
FH (M4/S3)	200
LM (M)	4.7
LH (M)	1.3
NO.STACKS	6

PLUME RISE DATA
SHAWNEE STEAM PLANT
12/ 5/74-1300 HOURS